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ALIEN PROPERTY CUSTODIAN

FEATHERDOWN FELT AND METHODS OF MANUFACTURING THE SAME

Sándor Dunay, Budapest, Hungary; vested in the Alien Property Custodian

Application filed April 9, 1936

The invention consists in a coherent structure of feathers and/or down, which may be termed a "featherdown felt," the fibres of the featherdown particles not being matted together but held together by an adhesive at the crossing points of the fibres of the featherdown particles which are in loose contact with one another.

By "featherdown particles" is meant either comparatively small bird feathers which have no quill at all (i. e. the underfeathers or actual down), or feathers which only have a thin quill (smaller coverts). For quite fine, flexible goods, feathers of the firstmentioned type alone may be used, and, for coarser goods, a mixture of both types of feathers may be used, while for quite coarse goods, for instance, chair stuffings, the second type of feathers alone may be used.

The adhesive may be applied to the featherdown particles in a non-solid condition and subsequently hardened. To this end, the adhesive may be kept suspended in a closed chamber in a finely-atomised liquid condition, like a mist, and the featherdown particles then introduced, on which the minute drops of the adhesive settle. The quantity of the atomised adhesive must not be so great that it moistens the featherdown particles to such an extent that the latter collapse, but must be sufficient to unite the featherdown particles at the crossing points of their fibres.

The atomising chamber is preferably provided with sieve inserts at the level of the bottom and the roof thereof respectively. The atomisation of the adhesive and the introduction of the featherdown particles are effected in the space between the sieve inserts. After the featherdown particles have settled on the bottom sieve insert, the upper sieve insert is lowered until the featherdown mass between the sieve inserts has acquired the desired layer thickness. The adhesive is then hardened.

The means employed for hardening the adhesive depend on its nature. If, for instance, glue is used for sticking the featherdown particles together, a glue solution is employed which is liquid at elevated temperature but solid at room temperature, and, before atomisation, the air in the atomising chamber is heated to a temperature at which the glue solution remains liquid. The air must contain sufficient moisture to prevent the glue droplets from drying up. For the purpose of hardening the glue solution, cold air is allowed to pass through the featherdown layer enclosed between the sieve inserts.

Alternatively, if a solution of an adhesive in an easily volatile solvent is used, the mode of procedure is similar, but the heating of the air saturated with the solvent vapours in the atomising chamber is dispensed with, the hardening of the adhesive being effected by evaporating the solvent by means of a warm air current. However, as a further alternative, a liquid adhesive may be used which is hardened by a simple increase in temperature, even without evaporation of the solvent, for instance, a rubber milk sensitive to temperature, which is brought into contact with the featherdown particles in an atomised condition and coagulated by means of hot air.

The use of liquid adhesives is attended with difficulties owing to the great sensitivity of the featherdown particles towards liquids. For the practical manufacture of the featherdown felt, therefore, it is considerably more suitable to apply to the featherdown particles adhesives which are solid at ordinary temperature and fusible by increasing the temperature, e. g., resins in a finely-powdered solid condition. This can be very simply accomplished by thoroughly mixing the featherdown particles with the finely-powdered solid adhesive, for instance, colophony, in mixing drums. The featherdown particles weighted with the adhesive dust do not fly like the unweighted particles and, therefore, can easily be treated in order to bring them into the particular form in which they are to be fashioned into a felt, by heating to a temperature above the melting point of the adhesive and subsequently cooling.

For producing felts of particular shape, such as prismatic or cylindrical felts, the featherdown particles mixed with the adhesive dust are introduced into a prismatic, cylindrical or other mould which determines the shape of the felt and are compressed to the desired layer thickness by means of a die which is movable in the mould in the fashion of a piston. The mould is then heated in a furnace to a temperature above the melting point of the adhesive and then allowed to cool down. Owing to the extremely bad thermal conductivity of the featherdown and because excessive heating thereof must be avoided, heating and cooling take a comparatively long time, particularly in the case of large layer thicknesses. Therefore, it is preferable to employ moulds with permeable walls and to effect the heating and cooling by passing through warm air and then cold air. In this manner, the heating and cooling can be quickly effected.

By a method similar to that just described, endless lengths of felt can also be continuously

produced. To this end, the mixture of featherdown particles and adhesive dust is introduced between parallel parts of two endless bands made of a permeable material, such as textile material, which are guided parallel at a distance apart which determines the thickness of the length of felt to be produced. At the parallel parts, first a heated air current and then a cold air current are successively passed through the moving conveyor bands and the featherdown layer therebetween.

The quantity of adhesive to be employed depends on its nature and the required strength of cohesion between the featherdown particles. When using colophony dust, for instance, good results are obtainable if the quantity of colophony amounts to 50–100% by weight of the quantity of the featherdown.

The compactness of the featherdown felt depends on the pressure to which the mixture of featherdown particles and adhesive is subjected during shaping by hardening, or melting and hardening, of the adhesive. If this pressure is quite small, an extremely loose, but nevertheless shape-retaining, coherent featherdown mass is obtained. This mass is extremely submissive to pressure, but is so resilient that the felt resumes its original shape on removal of the pressure.

The featherdown felt, particularly where continuous lengths of felt are concerned, may have a layer or skin of textile material, paper or other suitable material stuck onto one or both of its sides. This layer serves not only for increasing the strength of the featherdown felt and for protecting it, but also serves for preventing adhesion of the featherdown felt to the walls of the mould during shaping. To this end when making continuous lengths of felt, the conveyor bands, which effect the shaping of the lengths, simultaneously form the permanent facing of the felt. Similarly, the closed cylindrical or other moulds may also be lined with paper, textile material or any other suitable material, before introducing the mixture of featherdown particles and adhesive dust, such lining being stuck to the featherdown felt during the melting of the adhesive dust and removed together with the felt from the mould. In complicated moulds, the lining or skin may be formed, for instance from a layer of a cellulose derivative which may be applied as a solution, e. g., by spraying, to the inner wall of the mould, which is greased for the purpose of preventing adhesion.

Featherdown felt possesses, for quite a small specific weight per unit volume, excellent heat and sound insulating qualities, and has the advantage over loose featherdown that it is capable of retaining its shape. Consequently, its practical uses are extremely numerous. For instance, it can be used as a filling for quilts or cushions and it has the advantage over loose featherdown that the featherdown particles permanently retain their original relative positions, that is, they neither agglomerate nor gradually collapse. For the same reason, the featherdown felt is suitable as a warm lining for articles of clothing. Thinner layers of the featherdown felt can be employed not only as a lining for clothes, but also as sound insulation, for instance, for telephone kiosks, and for sound damping, for instance, in radio broadcasting studios. Owing to its high permeability to gases and its good filtering properties, the featherdown felt is also suitable as a gas filter, for instance, for keeping away dust and smoke e. g. as an air filter for internal combustion engines and as a smoke filter in cigarette tips or in gas masks. When using the featherdown felt for filtering purposes, the additional materials which are usual in gas or smoke filters may also be added to the featherdown particles simultaneously with the admixing of the adhesive.

SÁNDOR DUNAY.

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S. DUNAY
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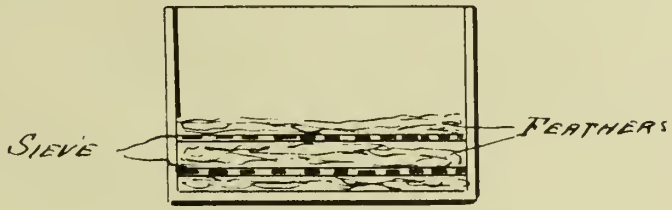

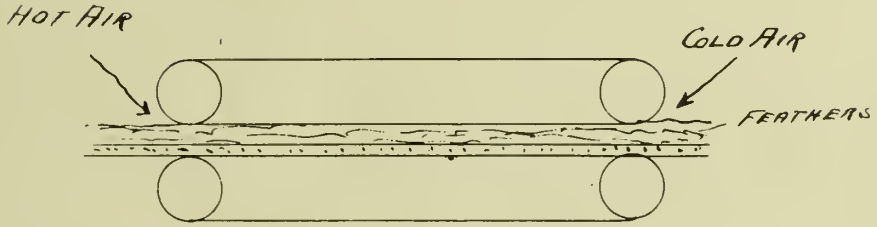

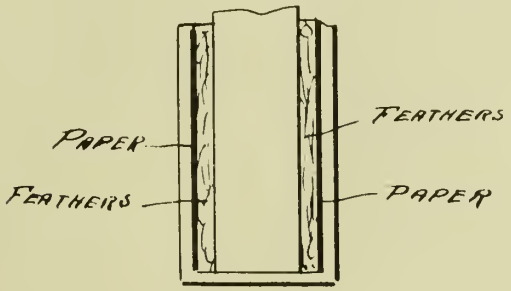

Inventor
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By E. F. Wentworth
Attorney

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ALIEN PROPERTY CUSTODIAN

BIOLOGICALLY ACTIVE SUBSTANCES

Károly Gyula David, Amsterdam, Holland; vested in the Alien Property Custodian

No Drawing. Application filed February 18, 1937

This invention relates to biologically active substances and to a method for the preparation of same and more particularly to such substances as have the action of a male sex hormone. It has particular reference to a process of preparing acylated derivatives of testosterone.

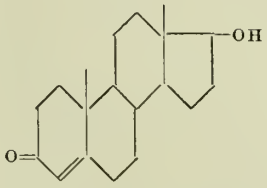
The present application constitutes a continuation in part of my copending application entitled: Production of "male sex hormone," Serial No. 122,324, filed January 25, 1937.

The primary object of my invention is to obtain acylated testosterone in the pure crystalline state.

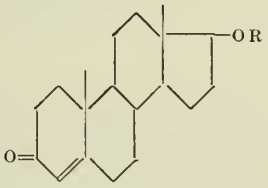
Another object is to obtain acylated derivatives of testosterone in such a state of concentration as to permit the administration to humans without substantial side reactions.

These and other objects have been obtained by the development of the processes and products which shall now be described more in detail.

I have found that the male sex hormone testosterone with the formula $C_{19}H_{28}O_2$ and the configuration



can be converted into compounds having the configuration



where R means an acyl group, by treating it with acylating agents.

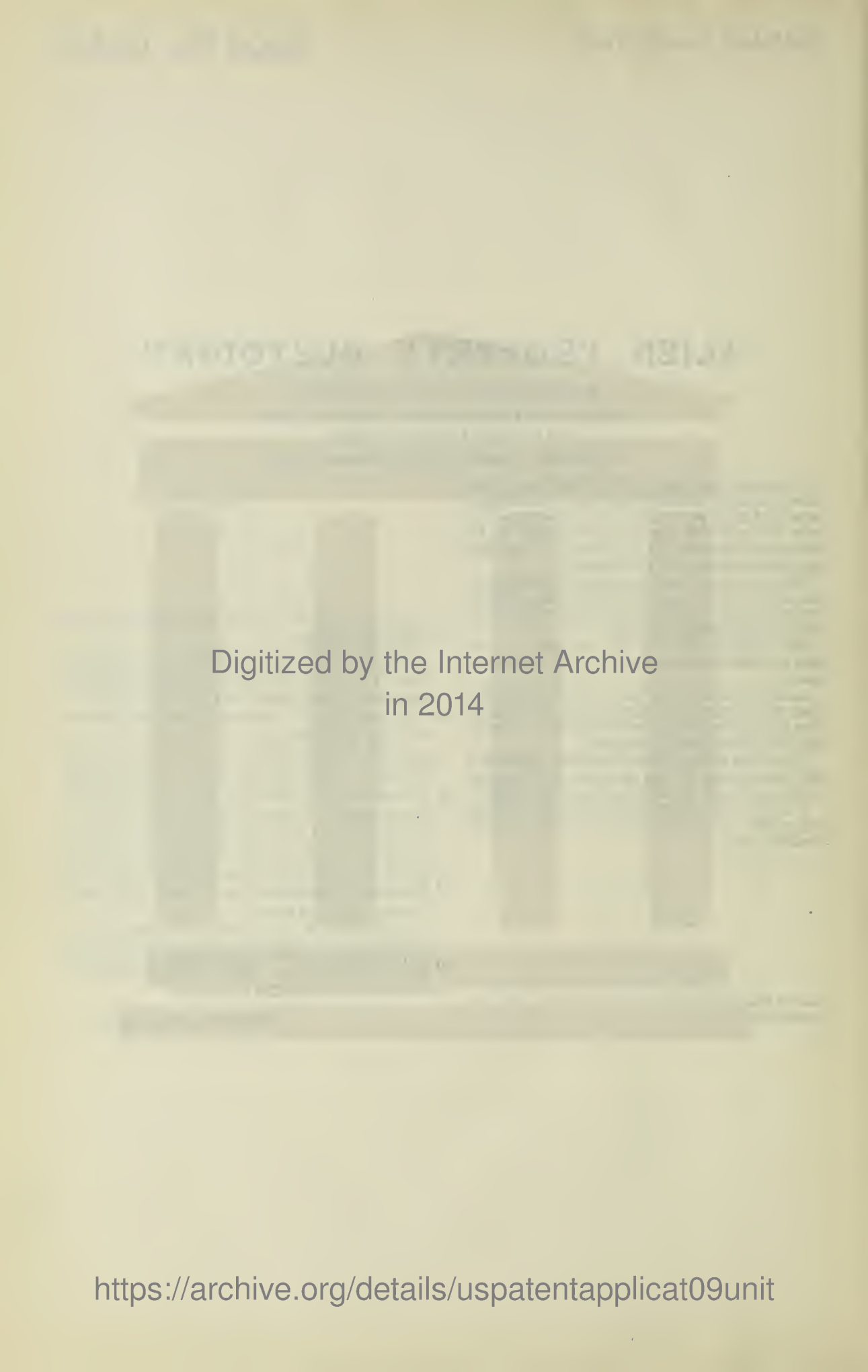
The esterification of testosterone can be effected by means being known to those skilled in the art to effect acylation. Crude preparations containing testosterone may also be used.

In practising my invention I may for instance proceed as follows:

10 mg of testosterone (M. P. 154,5° C.) are refluxed for 45 minutes with 1 cc acetic acid anhydride. Thereupon the excess of acetic acid anhydride is evaporated in vacuo. The remaining colorless substance is recrystallised from 80% acetone until a melting point of 140°–141° C. is attained. 8 mg of thick crystals are obtained, being testosterone acetate. When refluxed during 30 minutes with 2n-ethylalcoholic potassium hydroxide, hydrolysis takes place and testosterone is formed again.

I wish it to be understood that the process of preparing the acylated derivatives of testosterone is not limited to the exact details of the operations described, for obvious modifications will occur to persons skilled in the art.

KÁROLY GYULA DAVID.



Published June 22, 1943 Serial No. 173,206

ALIEN PROPERTY CUSTODIAN

TREATMENT OF MEDICALLY APPLICABLE SALT SOLUTIONS WITH ELECTRIC CURRENTS OF LOW VOLTAGE FOR THE PURPOSE OF STERILISATION AND DISINFECTION

Walter Kruse and Maximilian Johann Fischer, Leipzig, Germany; vested in the Alien Property Custodian

Application filed November 6, 1937

This is a division of our co-pending application No. 686,426.

The present invention relates to the treatment of medically applicable salt solutions with electric currents of low voltage for the purpose of sterilisation and disinfection.

The invention serves the purpose of providing the doctor with convenient means for himself sterilising the so-called physiological salt solutions required for his purposes, whether they be iso-tonically or hyper- or hypotonically constituted or converting them into strongly disinfectant but still physiological solutions, by the aid of a handy device. The only results similar to these hitherto obtained were brought about by treating the said solutions with high tension galvanic currents. In this procedure, however,—apart from the danger of high voltages—in addition to chlorine, a considerable quantity of ozone is developed which possesses unpleasant and less strongly disinfecting properties. According to the present invention it is proposed to work with currents of low voltage, for example, currents derived from 4–8 volt accumulators, the poles of which are connected with two small platinum plates acting as electrodes, which may, for example, measure 2x2 cm. As a result of the fact that the platinum plates are arranged in an insulating frame parallel to one another and at a distance of only about 1–2 mm. comparatively high currents are obtained which suffice to develop from the chlorides of the salt solutions so much active chlorine that about 1 litre of the solution is sterilised within a few seconds and within 10 to 20 minutes is converted into strongly disinfecting liquids. If it is desired to treat larger quantities of salt solutions then the duration of the currents is increased or the platinum plates are made of larger size.

A preferred constructional form of an apparatus for applying the invention in practice is illustrated by way of example in the accompanying drawing, in which:

Fig. 1 shows an immersion member according to the invention in side view,

Fig. 2 shows the said member in longitudinal section, and

Fig. 3 is a plan from below of the member.

Referring to the drawing:

The apparatus consists of two platinum electrodes **1** having surfaces of about 2 x 2 cm. which are arranged in an insulating frame **2** parallel to one another and at a distance of 1–2 mm. apart and which are connected with the source of current by means of wires **3** which pass through the handle **4** of the immersion member.

WALTER KRUSE.
MAXIMILIAN JOHANN FISCHER.

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BY A. P. C.

W. KRUSE ET AL

TREATMENT OF MEDICALLY APPLICABLE SALT SOLUTIONS WITH ELECTRIC CURRENTS OF LOW VOLTAGE FOR THE PURPOSE OF STERILISATION AND DISINFECTION

Original Filed Aug. 23, 1933

Serial No. 173,206

Fig. 2.

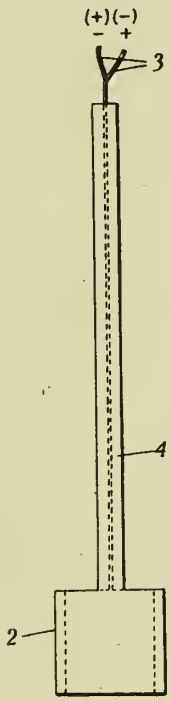


Fig. 1.

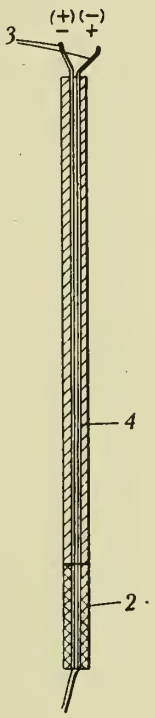
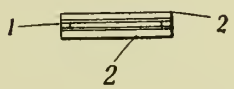


Fig 3.



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ALIEN PROPERTY CUSTODIAN

INCOMBUSTIBLE END PIECES

Jean Lepetit, Clichy, France; vested in the Alien Property Custodian

Application filed December 6, 1937

The present invention relates to end-pieces for electric cables in which one or more conductors are insulated from each other and with respect to a continuous metal sheath by means of a compressed pulverulent mineral insulation. The invention is particularly concerned with means for obtaining with the above mentioned type of cables end-pieces which are perfectly tight, incombustible and heat resisting, even fireproof.

It is known that in order to form the end device of such cables an insulating part of refractory materials called end-fitting is generally used, the said part bearing against the sheath and maintaining the required spacings on the one hand between the conductors and on the other hand between the conductors and the sheath. In order to secure the continuity of the dielectric material and at the same time the tightness of the end part, a low melting point insulating material is frequently used, which is for instance set in position by pouring in order to obtain a tight seal, or is inserted in any other way.

The said method, which has the advantage of being very simple has the disadvantage of introducing in the end device a material which is very sensitive towards heat without being resistant to the action of fire and finally constitutes a weak point.

The present invention has for its object to overcome the said disadvantage and to disclose means for providing an end piece which is tight, incombustible, heat resisting and fireproof.

The invention first of all consists in providing continuity between the pulverulent insulation of the cable and the end ferrules, by means of an insulating refractory powder, in order to constitute once more between both a refractory insulation or re-establish a continuity of insulation. The insulating powder used to this end may/or not may/be of the same chemical composition as the insulation of the cable and it may be simple or compound. By way of example the said powder will be so chosen as to secure some particular features such as reduced sensitiveness to moisture, be it chemical or physical sensitiveness, high dielectric rigidity, and the like.

The invention further consists in applying to the insulation thus recovered either directly by means of the end ferrule or indirectly a pressure which is sufficient to improve its dielectric features, reduce its sensitiveness towards moisture and the like.

The invention finally consists in obtaining owing to the above mentioned pressure the deformation of an incombustible plastic joint which secures the tightness of the end-piece.

An incombustible, heat resisting, fireproof end-piece will thus be obtained.

By way of example and for facilitating the understanding of the disclosure an end ferrule according to the invention for a one-pole conductor will be hereafter described with a reference to the accompanying drawing.

In the said drawing, **1** is the core of the cable, **2** the pulverulent refractory insulation of the cable, **3** the continuous metal sheath of the cable, and **6** the end ferrule of insulating, heat resisting material.

After drilling in the insulation **2** a recess **4**, adapted to the shape of the part of the end ferrule **5** which will come in contact with it, an insulating powder is inserted in said recess **4**, for instance a mixture of equal proportions of lime and mica. When the said powder has been thoroughly distributed the end ferrule **6** is applied in order to obtain the continuity of the insulation between the parts **2**, **6**. Finally is exerted upon the said ferrule by means of a nut **8** acting upon a flange **6***a* of the end ferrule, the pressure which is necessary for recovering the features of the pulverulent compressed dielectric material.

In the above described example a metal-plastic joint **7** is inserted between the flange **6***a* of the end ferrule **6** and the bearing of the nut **8**. If the temperature to which the piece should be capable of resisting is lower than 572° F. a solid lead joint may for instance be used; if said temperature is higher than 572° F., a copper and asbestos joint will for instance be used. The locking nut **8** is screwed in a threaded socket **9**, which may be a metal socket and is itself attached to the sheath of the cable by means of a deformable joint **10**; **11** forming a stuffing box of same material.

The attachment of the socket **9** to the sheath **3** may further be obtained in any other convenient way, such as welding or even by directly screwing, by means of suitable threads, the said socket **9** on the said sheath **3**.

Finally a nut **13** bearing on the inside thread of the end ferrule secures by means of an incombustible metal-plastic joint **12** the required tightness between the end ferrule and the conductor **1**.

The end ferrule described is removable.

JEAN LEPETIT.

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J. LEPETIT
INCOMBUSTIBLE END PIECES
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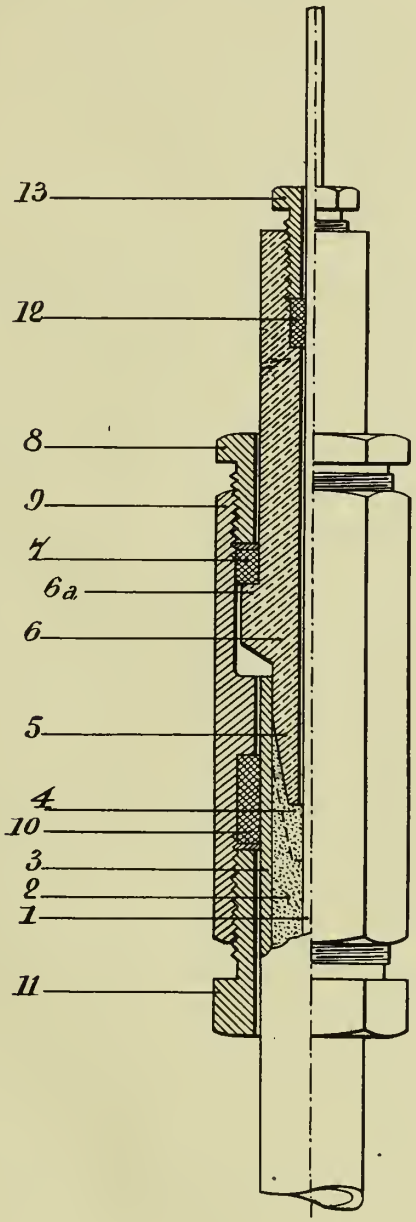

INVENTOR
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By
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ALIEN PROPERTY CUSTODIAN

ARTICLE OF MANUFACTURE CONSISTING WHOLLY OR IN PART OF SYNTHETIC RESIN AND PROCESS OF PRODUCING THE SAME

Arnost Fischer, Prague, Czechoslovakia; vested in the Alien Property Custodian

Application filed December 15, 1937

It has been impossible hitherto by the aid of the usual binders to satisfactorily unite articles of any kind made of synthetic resin masses with other articles because the usual binders do not stick sufficiently to the synthetic resin mass. In cases when synthetic resin masses have been united by means of special binders with other articles it has been necessary always to roughen the surface of the synthetic resin mass. But even in this way it has not been possible to secure reliable adherence to the surface of the synthetic resin mass.

Now it has been found that it is possible to provide synthetic resin masses with surfaces which are fit for sticking to binders, by inserting between two surfaces to be made fit for sticking to binders, either before the final hardening or after subsequently effected softening, a layer of a material which is impervious to the liquid or liquefied synthetic resin mass and whose particles have a lower mutual cohesion than the adhesion thereof to the hot synthetic resin mass, and then compressing together, in a manner known per se, with application of heat, the synthetic resin masses having the intermediate layer between them and after the two compressed surfaces of synthetic resin masses have cooled down tearing them away one from the other. In this way the particles of the intermediate layer, owing to their good adhesion to the synthetic resin mass, are deposited upon the two surfaces of the synthetic resin masses in the form of a uniform coating which however is rough and fit for sticking to binders.

It has been found that parchment paper is a particularly suitable material to be used for the intermediate layer.

The present invention may be applied in all cases when it is desired to provide on articles of wood, metal or the like a surface of synthetic resin mass sticking thereon. In this way it is possible for instance to have stuck on any desired base by any suitable binder veneer-like thin sheets or plates of Bakelitized paper or wood having the surface thereof sticking to binders, or to unite together such synthetic resin impregnated and hardened layers which are provided on both sides with a surface of this kind so as to form a structure similar to ply-wood. The invention may be of use not only in the manufacture of furniture but also whenever it is desired to provide articles with a surface layer which is resistant to external influences and/or ornamental, as for instance in the manufacture of skis or of coatings of all kinds.

Example

In the usual production of plates by compression of paper impregnated with hardening synthetic resin at elevated temperature, where a pile of 30 superposed sheets of paper was used, two sheets of parchment paper were inserted one between the tenth and eleventh paper sheet and the other between the twentieth and twenty-first paper sheet and then the pile was compressed and left to cool as usual. It was found that the upper ten paper layers impregnated with hardening synthetic resin as well as the intermediate ten paper layers and the lower ten paper layers are united together in the known way to form solid plates having an entirely homogenous appearance from outside. On the other hand the three elementary plates so obtained may be easily torn away in the zones determined by the insertion of the parchment paper sheets, the particles of the parchment paper sticking on the surface in the form of a rough layer. In this way three plates are obtained of which two are provided on one side, and one on both sides, with a surface that sticks well to binders of all kinds.

ARNOST FISCHER.

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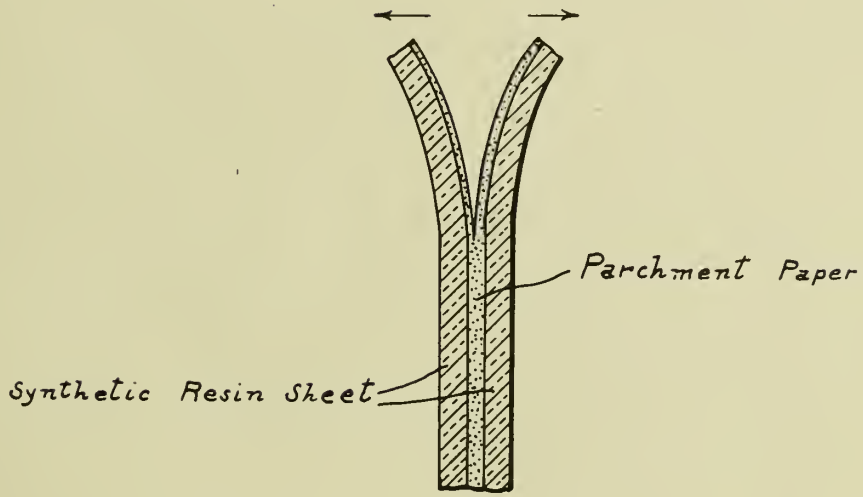

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Attorneys

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ALIEN PROPERTY CUSTODIAN

MANUFACTURE OF FABRIC LAYERS PROVIDED WITH WATER REPELLENT COATINGS

Margarete Marcus, Vienna, XVII, Austria; vested in the Alien Property Custodian

Application filed February 3, 1938

The invention relates to the manufacture of fabric layers provided with a water repellent coating, consisting advantageously of a solid cellulose derivative such as Celluloid or cellon, which goods are more particularly used for manufacturing collars, cuffs, chemisettes, shoe uppers, covers, curtains and the like. In this process the problem is met with to obtain a firm and reliable union between the fabric and the covering coating and more particularly to obtain at the edges of the goods a water repellent smooth closure. Especially on applying very thin Celluloid or cellon coatings to comparatively thick fabrics it is found that the layers do not properly adhere to one another and that there are always loose ends of thread of the fabrics which interfere with the object of the Celluloid or cellon coating to make the article water repellent.

In order to avoid these drawbacks solvents or agglutinants have heretofore been used; however the production becomes thereby more complicated and expensive and the quality of the product is frequently affected in an undesirable manner.

By the process forming the subject matter of the invention a firm union between the fabric and the covering coating is obtained without the use of a solvent or agglutinant by pressing the cover coating onto the fabric and heating at the same time such cover coating to a temperature at which the cover coating is softened by the beginning melting. If thin foils of cellon are used it is sufficient to heat the press plates or press cylinders to 140° centigrade in order to obtain a superficial melting of the cellon foils. By pressing the softened cellon foils on the fabric the cellon is penetrating partly into the meshes of the fabric so that a uniform plate is obtained which resists any stresses tending to separate the united layers.

It was also found that the adhesion of the layers is further notably increased if prior to their union with the Celluloid or cellon coating the fabrics are impregnated with a casein solution. For the impregnation advantageously a solution of casein in an alcali, for instance in caustic soda diluted with water, is used.

The impregnation imparts to the fabric a certain stiffness which is often desirable especially for collars and cuffs and more particularly prevents distortions, warpings and formation of folds which would interfere with a good union with the covering coating. Besides increasing the adhesion the impregnation also results in so uniting the threads of the fabric that loose ends of these threads at the edges of the article are no more met with.

If white fabrics are treated in this way it will be found that the product is discoloured having become yellowish to brown which may be undesirable more particularly with linen goods such as collars, cuffs and the like. This drawback may be done away with in the process according to the invention by incorporating into the casein solution a pigment which does not impair the increased adhesion due to the casein solution. For this purpose more particularly the dioxide of titanium (TiO_2) is suitable which is added in the form of a powder in the ratio of two parts by weight of the powder to five parts by weight of the solution.

In the manufacture of collars, cuffs and the like fabric layers treated in accordance with the invention various means may be used for obtaining the desired degree of stiffness and impregnation of the product. Thus rows of stitches may be sewn in the fabrics or reinforcing pieces, strips or bars may be sewn to the fabric and then the cellon sheets may be pressed on the fabric. For facilitating the sewing patterns may be used which advantageously consist of a piece of fabric containing rows of stitches in the arrangements which it may be desired to produce on the impregnated layers. The pattern is pressed onto the impregnated fabric the rows of stitches on the pattern leaving impressions for the stitches to be made on the impregnated fabric. After sewing the rows of stitches and the reinforcing strips on the impregnated fabric the cellon sheets may be placed on the impregnated layer and secured in position by pressing with the aid of heating in the same press in which the lines of rows of stitches were printed on the impregnated fabric. The said pressing of the sheet of cellon by pressing in the heat takes preferably place between elastic surfaces such as rubber plates, fabrics impregnated with rubber or the like, the plates being either placed on the cellon sheet or on the pressing plates. By the use of such rubber plates it is also avoided that the cellon foils adhere after pressing on the press plates or cylinders.

The same press may also be used for obtaining the desired lustre on the surface of the articles manufactured. For this purpose metal plates preferably of stainless steel are used, the surface of which has been made more or less smooth by polishing or treatment by means of sand blower according to the desired nature of the articles to be manufactured. After pressing with the aid

of heat the fabric provided with the cellon coating adheres to the metal plate but can be readily removed after cooling.

If by the process described articles of a soft nature or of a comparatively low stiffness have to be manufactured, difficulties may arise because the cellon coatings treated with the known softening agents lose their softness after some time and become comparatively stiff. In order to avoid these drawbacks the fabric core is impregnated with any one of the known liquid softening agents for derivatives of cellulose before the covering coating is applied thereto, so that this agent acts only gradually on the covering coating.

The process is advantageously carried out in the following manner:

Onto both sides of a cellon foil of a thickness of 0.1 to 0.15 millimetres a layer of fabric made of comparatively thick yarn and with small mesh is pressed with the aid of heat so that the layers of fabric firmly adhere to the cellon foil. The product thus obtained is impregnated with a softening agent, such for instance as tricresyl phosphate, triacetine or the like. The impregnation may be brought about by immersion or by brushing or sprinkling. The compound layer obtained as above described may be, prior to the impregnation, provided with quilting seams or with reinforcing pieces, strips or bars. Then onto both sides of the impregnated combined layer thin cellon foils are placed and pressed thereon in the same press that had served for pressing the fabric layers onto the core foil the combined layers being heated to about 110° to 140° centigrade.

In order to further increase the efficiency of the softening agent a comparatively small quantity say 20% of a solvent for the cellulose derivative such as acetone may be added to said agent.

It has been found that in a product obtained by the process described the covering coating keeps its softness even if the article is kept on store or is in use for a long time. The impregnated fabric acts like a store for the softening agent so that comparatively stiff covering coatings become soft only gradually after their application and retain their softness for a long time of use.

The process according to the invention may be used both for white and for coloured fabrics. For the latter a method is especially suitable which is illustrated by way of example in the annexed drawings. Fig. 1 is a plan view and Fig. 2 a transverse section of a structure composed of two layers of coloured fabric and three layers or foils of a derivative such as cellon alternating with said two layers of fabric.

Two coloured fabric layers 1 and 2 are coated each on one side only with a white cellon foil 3 and 4 respectively and heated when pressed on the fabric as above described. On the cellon foil of the outside fabric of the article to be manufactured the lines 6 for the stitches are printed by means of a pattern as above set forth whereupon rows of the stitches and stiffening pieces, strips or rods 7, if at all required, are sewn or fixed respectively on the fabric. Then one of the fabric layers is laid on a thin transparent cellon foil 5 and the second fabric layer is laid on the first fabric layer so that the white cellon foils 3, 4 are in contact with one another. Finally on the free side of the second fabric layer also a thin transparent cellon foil 8 is laid. The layers built up in this manner are then pressed together and heated to the temperature of beginning melting of the cellon foils so that the core foils 3. 4 are firmly united with one another and both the core foils and the covering coatings 5. 8, are united to the fabric layers 1, 2. The product thus obtained forms a uniform smooth plate, the outer faces of which show the desired colours, owing to the transparency of the outer covering coating 5, 8 and the white background formed by the core foils.

The process according to the invention may be used in the manufacture of various articles made of fabric layers. It is also possible to treat only parts of an article by the described method. For example collars or cuffs permanently fixed on shirts, or cuffs fixed on detachable sleeves may be treated in a similar way.

The most important advantage obtained by the present invention consists in the simplicity and the rapidity of the process resulting from the absence of any solvent or agglutinant which would have to be dried so that the different steps of manufacture can immediately follow one another.

MARGARETE MARCUS.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

M. MARCUS
MANUFACTURE OF FABRIC LAYERS PROVIDED WITH WATER REPELLENT COATINGS
Filed Feb. 3, 1938

Serial No.
188,585

Fig. 2

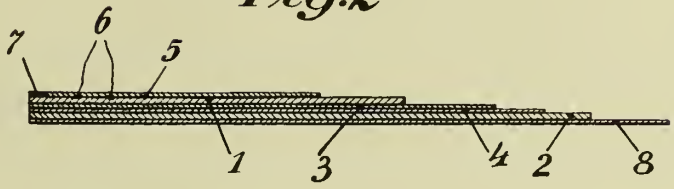
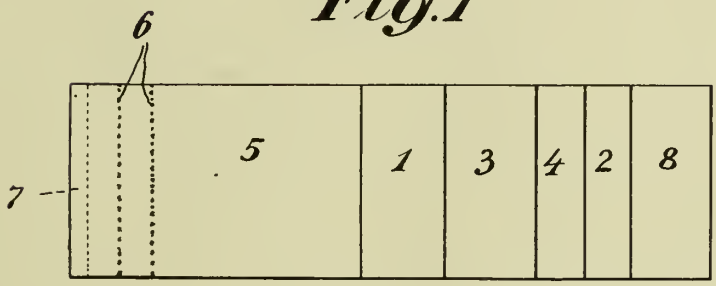


Fig. 1



Inventor:
M. Marcus,
By E. F. Hendricott
Atty.

Published June 22, 1943 Serial No. 245,285

ALIEN PROPERTY CUSTODIAN

METHOD OF MANUFACTURING STRAINLESS GLASS SHEETS

Hideo Yamamoto, Yokohama, Japan; vested in the Alien Property Custodian

Application filed December 12, 1938

My invention relates to a method of manufacturing strainless glass sheets by using special cooling means, and its object is to produce sheet glass of best quality having homogeneous structure and less internal strain.

It has heretofore been known that in the Fourcault, Pittsburgh, Colburn or other sheet glass drawing methods, a glass sheet is continuously drawn from a drawing kiln into a chamber where the sheet is annealed while it is held vertically or bent horizontally and cut into a desired length. As soon as the glass sheet is drawn from the drawing kiln gradually forming hardened edges by a suitable method, the glass sheet is uniformly cooled in horizontal direction at once by coolers and solidified, thus, the reduction of breadth of sheet and shrinkage are avoided by means of surface tension. For this purpose, it has been considered to be absolutely necessary to cool the glass sheet in horizontal direction at a possibly uniform temperature. If such cooling method is not applied, the breadth of the drawn sheet will be reduced and the sheet becomes wavy and is liable to break, thereby making the drawing operation difficult. Such facts can be clearly recognized from the fact that all heretofore known coolers have uniform breadth horizontally along the glass sheet or rather gradually enlarged breadth towards the center so as to provide the largest cooling effect in the central part of the sheet.

The glass sheet, however, made by using the above described cooling method, especially such glass sheet drawn at high temperature as in Pittsburgh process has not only greater internal strains but also its distribution becomes ununiformly since the sheet is cooled uniformly along breadth by the cooler and is subjected to such a severe effect as the glass sheet is very often broken while it is drawn or when the sheet is cut off. But the cause of such failures had not been made clear and it has been considered unavoidable result when glass sheet is manufactured by the drawing method.

The inventor made careful investigation to find out the cause of the above defects taking various facts into consideration and discovered a new method of cooling the glass sheet which is quite contrary to the known method, viz. instead of cooling the sheet uniformly along the breadth, the coolers are so devised that the cooling effect may be gradually retarded towards the center of the sheet from both side edges. Then the internal strains of the glass sheet can be extremely reduced and distributed uniformly so that the well cuttable glass sheet of splendid quality may be obtained.

The variation of cooling effect from both side-edges is preferably made similarly, yet it is not necessary to limit the cooling effect in the center part of the sheet to the minimum, but the minimum point may be shifted somewhat to one side from the centre, if the position is not changed suddenly, then the object of this invention can be similarly attained.

The rate of cooling for the glass sheet in this invention may be adjusted in accordance with the drawing speed of the glass sheet and better results can be obtained if the cooling speed in cross-wise direction is regulated to be nearly the same against the cooling speed along its drawing direction.

In carrying out my invention the most effective and simple method is to reduce the breadth or thickness or both of ordinary coolers towards the center from both sides along an arc or straight lines or step-by-step, or by forming the coolers having a constant breadth in arcuate shape along the drawing direction of the glass sheet or by curving the cooler gradually remote against the glass sheet towards the middle from both sides. The object can also be attained with the coolers of constant breadth by reducing the quantity of cooling medium or by changing the area of heat radiating surface at the middle of the glass sheet. Accordingly it should be understood that the present invention is not limited to the definite means as above described, but without departing the spirit of this invention, other various combinations or modifications can be effectively applied. For instance, auxiliary coolers may be used in combination with ordinary coolers, and also the above cooling means may be applied to only one side of the glass sheet.

In manufacturing glass sheet by the above described method of this invention, the cooling in the cross-wise direction maintains good balance in respect of the cooling in the drawing direction of the glass sheet, viz. the sheet is cooled to the inside from the outside comparatively uniformly along the longitudinal and cross-wise directions of the glass sheet. Accordingly the sheet is not made wavy and is subjected to very few internal strain which, if any, can be uniformly distributed all over the sheet. Thus the glass sheet of superior quality which can be well-cuttable is produced and which does not break when worked for such as polishing or grinding. Such facts can easily be recognized by inspecting the sheet through a polarizer.

My invention will be better understood from the following description when considered in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the drawing, Fig. 1 is a diagrammatic view partially in section of a glass sheet manufacturing device by the drawing method taken for the explanation of my invention; Figs. 2 to 4 are front views of coolers embodying my invention; Fig. 5 is a plan view of the cooler of my invention; Figs. 6 and 7 are a front elevation and its plan view of a cooler respectively illustrating a modified form of my invention.

Now referring to the drawing, 1 represents a part of the drawing kiln containing molten glass 2. 3 represents a glass sheet to be drawn through a suitable floating guide 4 and by means of rollers 6. 5 is the cooling device of my invention arranged adjacent to the glass sheet 3 above the outlet of the guide 4.

In accordance with my invention, the cooler 5 is formed as shown in Figs. 1, 2 and 3 with the gradually reduced breadth towards the middle horizontally from both ends, or as shown in Fig. 4 with equal breadth but curved along an arc, or as shown in Fig. 5 with equal breadth but located at the gradually reduced distance to both ends from the middle. Cooling medium such as cold water or cold air is supplied from the pipe 8 into the cooler 5 and is taken out through the pipe 9. In all of the coolers shown in Figs. 1 to 7, the cooling effect for the glass sheet is largest at both ends and gradually reduced towards the middle where the cooling effect is smallest. With the above device, the glass sheet 3 drawn through the floating guide 4 is cooled at both side edges more rapidly than the other parts and forms the hardened edges 7 at first. Thus the molten glass film is extended between the hardened edges 7 as the glass sheet is drawn gradually and cooled towards the middle from both edges with the reduced effect so that the cooling effects in the horizontal and vertical directions of the glass sheet maintain the balance to facilitate the manufacture of strainless glass sheet.

Figs. 6 and 7 show another example of the cooler which is provided with heat radiating ribs 10 arranged with gradually increased pitches towards the middle from both sides for equally attaining the object of this invention.

HIDEO YAMAMOTO.

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BY A. P. C.

H. YAMAMOTO
METHOD OF MANUFACTURING STRAINLESS GLASS SHEETS
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Serial No.
245,285

Fig. 1

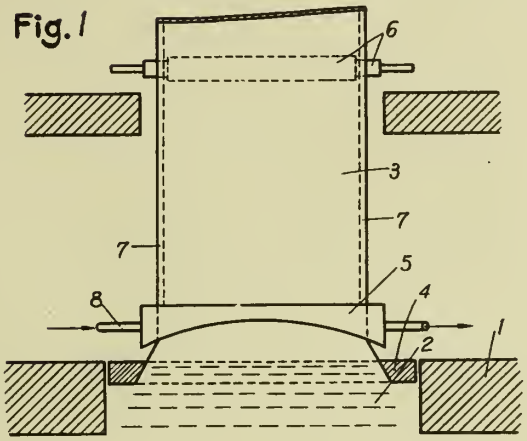


Fig. 2

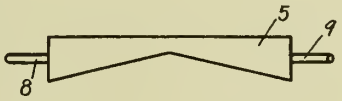


Fig. 3

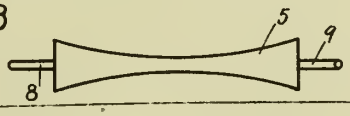


Fig. 4

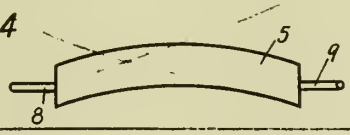


Fig. 4

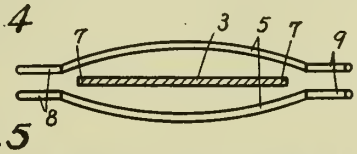


Fig. 5

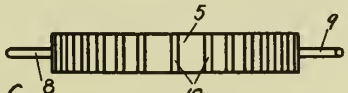
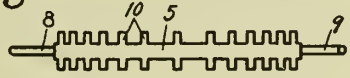


Fig. 6



INVENTOR.
Hideo Yamamoto

Published June 22, 1943 Serial No. 255,603

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE DISSOCIATION OF FATS

Arrigo Rastelli, Milano, Italy; vested in the Alien Property Custodian

Application filed February 10, 1939

According to the most commonly used method, the fats are subjected, in the presence of steam, to a certain pressure at a certain temperature, whereby the glyceride is dissociated into glycerine and fatty acid which subsequently are separated the one from the other. This operation has hitherto been carried out in the following manner: the fat is introduced, together with a certain amount of water, into an autoclave; the autoclave is closed and steam is introduced which, at a pressure of 6–10 atm. and at the correspondant temperature, causes the fat to hydrolyse. The operation is, however, rather long and lasts at least 8 hours. It has been proposed to speed it by stirring the mass; the difficulties, however, practically encountered in placing the stirrers, are not sufficiently compensated by reduction of time.

I have now found that the dissociation of fats can be realised in a continuous manner by introducing an emulsion of water and fat through a tube of relatively small diameter, in which a high pressure and a high temperature are kept; it is then possible, owing to the fine subdivision of the mass, to obtain a rapid dissociation, not obtainable in the autoclave; it is sufficient, if length of tube, temperature, pressure and rate of flow of the emulsion are regulated in such a manner that at the outlet of the tube the fat be completely separated into the 2 layers: fatty acid and glycerine containing water.

It will be advisable to use a copper tube of a diameter varying from 10 to 100 mm., externally heated by means of an oil bath, a pressure between 10 and 40 atm. and a correspondant temperature, between 150° C. and 250° C.; and finally to add a catalyst for the reaction of the same type as those already used in the ordinary process; for instance zinc oxide. Under these conditions yields, even higher than those obtainable in the autoclave, can practically be obtained.

The attached drawing shows a diagrammatic realisation of the process. The vessels **1**, **2** and **3** contain the fat, the water and the catalyst respectively. The 3 reactants are introduced, in the desired amounts, into the apparatus **4**, where they are conveniently emulsionised; the emulsion is sucked up from pump **5** and compressed in the decomposition tube **6**. This tube is immersed into a bath contained in vessel **7**, heated to the desired temperature by hearth **8**; at the end it is provided with a conveniently regulated valve which permits the mixture after reaction to pass into the decanting vessel **10**; the fatty acid which forms the higher layer, passes into vessel **12** through tube **11**; the glycerine containing water passes on to vessel **14** through tube **13**.

The principal advantages offered by this new process are as follows:

(1) The operation is carried out in an absolutely continuous manner; if the particulars of plant are conveniently elaborated, a completely automatic working can be obtained which guarantees a greater regularity of yields and at the same time requires a much smaller number of workmen than that required for the intermittent process in the autoclave.

(2) The much more reduced sizes of the apparatus, in which the dissociation takes place, allow to reduce the plant costs and especially to economise in materials which is a very important fact, since, as it is well known, the only really suitable metal for the dissociation of fats is copper.

(3) Owing to the little flowing capacity, the mixture of glycerine containing water and fatty acid is allowed to decant in a much more regular and calm manner than that stated when opening the autoclave.

(4) The plant has a much longer duration, since the copper, under these conditions, is not brought in contact with air, which, on the other hand, occurs by force in the known plants, when the autoclave is opened.

(5) Owing to the small masses subjected to high pressure, the explosion danger is practically null.

(6) No steam plant is required, since heating is externally obtained.

ARRIGO RASTELLI.

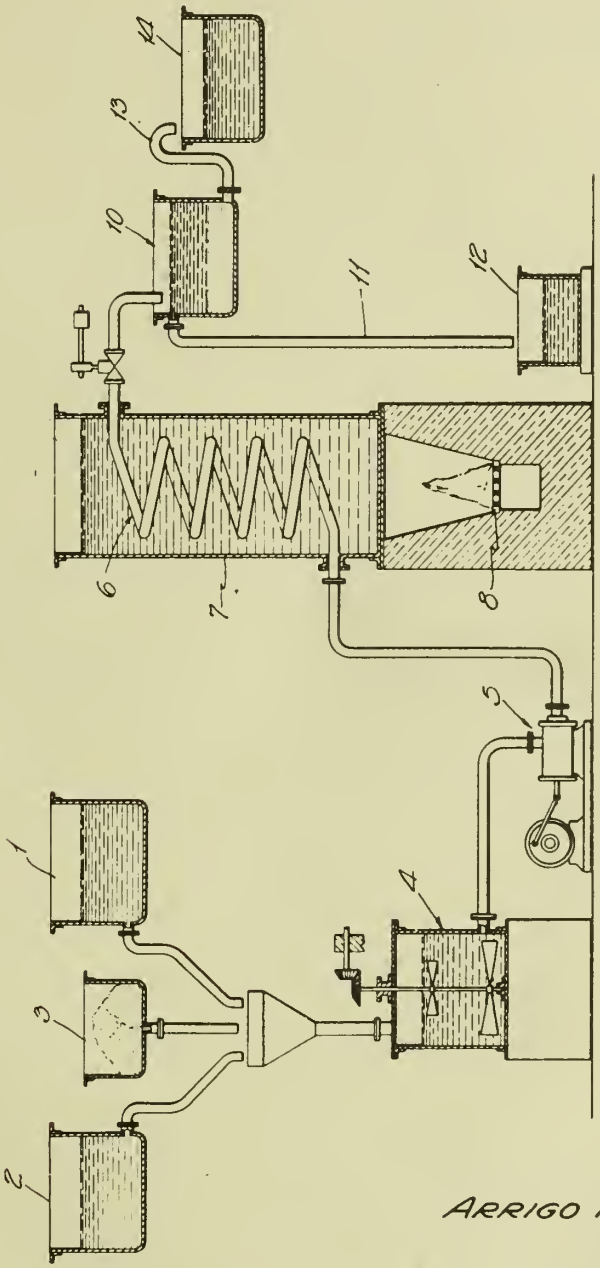
PUBLISHED
JUNE 22, 1943.
BY A. P. C.

A. RASTELLI

PROCESS FOR THE DISSOCIATION OF FATS

Filed Feb. 10, 1939

Serial No.
255,603



ARRIGO RASTELLI
INVENTOR

BY Knight Bros.
ATTORNEYS

Published June 22, 1943 Serial No. 257,762

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE PROTECTION OF MAGNESIUM-BASE METALS

Jean Frasch, Clichy, France; vested in the Alien Property Custodian

No Drawing. Application filed February 21, 1939

The object of the present invention is a process for the protection of magnesium and magnesium-base alloys by means of a superficial coating.

The anodic or electrolytic treatment of magnesium and its alloys has heretofore generally been effected in alkaline solutions with a view to depositing coatings of oxide, silicates or aluminates, the said solutions sometimes containing in addition other alkaline salts such as borates, chromates, phosphates and molybdates. But coatings so obtained have never given entire satisfaction.

Up till now acid solutions have not successfully been employed for the anodic or electrolytic treatment of magnesium and its alloys. Such solutions have only been used in the form of bichromates to which concentrated nitric acid has been added in order to deposit a golden surface film, or of boiling chromic acid for the purpose of cleaning the surface of the metal and dissolving the oxide deposit which is generally present.

Recently attempts have been made to protect magnesium and its alloys anodically or electrolytically by means of solutions of phosphates, sulfates or other alkaline salts to which CrO^3, $K^2Cr^2O^7$ or $KCrO^4$ have been added. Such solutions deposit on the surface of the metal, in addition to an oxyde of chromium, on oxyde or salt of magnesium which is only moderately resistant to corrosion.

I have now discovered that it is possible to deposit on magnesium or its alloys coatings highly resistant to corrosion, by treating such metals in a bath containing chromic acid in the presence of alternating current.

No other salt or oxide capable of taking an active part in the electrolytic treatment may be present.

The solution used may preferably consist of 5 to 30% of CrO^3 in water. One may also add to such a solution small quantities of sulfuric acid or chromium sulfate, preferably in the ratio of 0.5 to 3%, calculated as SO^3 to CrO^3 present.

The pH of the bath should be maintained at less than 2. This may be done by the appropriate addition from time to time of chromic acid and if necessary of sulfuric acid.

I have found that when magnesium or its alloys are treated with alternating current in such a bath a dark brown or black coating is deposited on the surface of the metal. This film consists of an oxyde of chromium, intermediate between Cr^2O^3 and CrO^3, and contains practically no metal other than chromium.

I have further made the surprising discovery that the above mentioned protective film is porous and far from being of an insulating nature, easily permits the passage of alternating electric current. The voltage across the bath only falls slightly during the electrolytic treatment and remains almost constant for its duration.

Thus, for example, if one applies a potential of 2 to 10 volts between the electrodes, regulating the current at from 2 to 15 amps. per dm^2, I have observed, in contradistinction to all other heretofore known electrolytic processes for protecting magnesium and its alloys, that the current only falls slightly during the treatment, the dark film formed on the metal offering but little resistance to the passage of the current. For example an initial voltage of 5 volts will fall to about 4.5 volts at the end of the treatment.

I give below the composition of two baths particularly well suited for putting my present invention into effect, but these baths are cited merely by way of example, and all baths which conform to the characteristics previously cited are capable of being utilised.

Example I

Composition of bath	CrO^3 ---grs. per litre--	300
	H^2SO^4 ---grs. per litre--	5
Voltage ---------- volts--		4
Current ---------- amp/dm^2--		8
Time ---------- minutes--		10
Temperature ----------		Room temperature.

Example 2

Composition of bath, CrO^3 ----grs. per litre--		50
Voltage ---------- volts--		8
Current ---------- amp/dm^2--		4
Time ---------- minutes--		15
Temperature ----------		Room temperature.

After the electrolytic treatment the objects are withdrawn from the bath, copiously rinsed and dried, preferably hot. Subsequently the objects can be subjected to a finishing treatment, for example by means of paraffin, paint, etc. . . . which increases the resistance of the protective coating to corrosion.

In particular, since the protective film is porous, one obtains excellent results by means of immersion of the pieces in hot paraffin, for example at about 180° C.

The previously described bath containing chromic and sulphuric acids has moreover the advantage of being one well suited to the preliminary pickling of the metal objects to be electrolytically treated, with the result that no prior pickling is necessary.

I have also discovered that magnesium or magnesium-base alloys assembled with an other metal such as iron or aluminium, can be satisfactorily treated in the above mentioned bath.

My invention covers, as new industrial products, not only baths as specified for the electrolytic treatment of magnesium and magnesium-base alloys with a view to producing protective coatings resistant to corrosion, but also all objects in magnesium or its alloys which are covered with the afore described protective coating consisting substantially of an oxyde of chromium, and this protective coating itself.

JEAN FRASCH.

Published June 22, 1943 Serial No. 265,605

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE PREPARATION OF CATALYSTS FOR HYDROGENATION

Joseph Zeltner, Paris, France; vested in the Alien Property Custodian

No Drawing. Application filed April 1, 1939

It is well known that catalysts for the hydrogenation of certain organic compounds can be prepared if an alloy of certain metals is decomposed by the action of neutral or alkaline substances attacking only one of the alloyed metals.

The present invention has for its object a process, for the preparation of catalysts for hydrogenation, and is particularly applicable to nickel catalysts. The said invention consists, for example, in treating an alloy of nickel and a more electropositive element, such as magnesium or calcium, with a weak or dilute acid, used in such proportions as to correspond at least to all the magnesium or other electropositive metals contained in the alloy. The treatment can be carried out in the hot or in the cold. The alloy can be subjected to the treatment in the form of lumps, shavings, etc., but it is preferable to treat it in the powdered form.

All acids which do not attack the nickel but which are capable of dissolving the more electropositive metals, may be used. The inventor has achieved particularly favourable results when using acetic acid to attack a magnesium-nickel alloy.

The inventor has moreover discovered that the action of the said weak or dilute acid is facilitated if the alloy is previously treated with boiling water or a neutral or saline solution.

By way of example, a useful nickel catalyst, giving excellent results in the hydrogenation of many unsaturated organic compounds, may be prepared as follows. An alloy containing 55% of nickel and 45% of magnesium is finely powdered and then treated with boiling water or a solution of the salt of a strongly electro-positive metal, provided the salt exhibits no tendency to poison the catalyst subsequently. The alloy is next treated with a 20% solution of acetic acid in water. The catalyst and the solution are mixed in small portions until there is no more evolution of hydrogen. The solution of magnesium acetate so obtained is decanted, and the undissolved nickel is washed with water. It can then be kept under suitable conditions for long periods without its catalytic properties being impaired. For example alcohol forms an excellent medium for its conservation.

A nickel catalyst so prepared is extremely active.

In the preparation of nickel catalysts according to the said invention, the use of acetic acid as described in the above example may be replaced by any other weak or dilute acid capable of dissolving the magnesium or other electro-positive metal, but having only a slight action on the nickel constituent, or none at all. Thus propionic acid forms an excellent substitute for acetic acid in the case of nickel-magnesium alloys.

Similarly the nickel in the alloy may be replaced by any other metal which is attacked only slightly or not at all by the weak or dilute acid employed, provided always that the metal in question so treated forms a useful catalyst for hydrogenation.

Similarly, the process is equally applicable to a mixture of metals, either electropositive and capable of being attacked by a weak or dilute acid, or resisting attack by the said acids and capable of serving as catalysts. Thus, instead of magnesium or calcium, one can employ a mixture of these two metals, or indeed any alkali or alkaline earth-metals, either alone or together. One can also prepare, according to the said invention, by attacking with weak or dilute acids an alloy of the metals to serve as catalysts with more electropositive metals, a mixture of catalysts, such as a catalytic mixture of nickel and iron.

The said invention also covers, as new industrial products, all active catalysts for hydrogenation prepared as hereinbefore described.

JOSEPH ZELTNER.

Published June 22, 1943 Serial No. 281,690

ALIEN PROPERTY CUSTODIAN

CATALYTIC PROCESS FOR CONVERTING LIQUID AND GASEOUS HYDROCARBONS INTO ANTI-KNOCK SPIRIT AND AROMATIC HYDROCARBONS

Marcel Nitescu, Bucharest, Roumania; vested in the Alien Property Custodian

Application filed June 28, 1939

This invention relates to an industrial process for converting liquid or gaseous hydrocarbons of various origins, having in general a paraffinic base, into anti-knock spirits and into aromatic hydrocarbons, selective catalysts being employed suitable for certain reaction groups duly characterized by the invention.

The use of selective catalysts has been studied with the object of obtaining anti-knock combustibles and aromatic hydrocarbons in the best conditions, enabling optimum conditions to be realised so that the intermediate reactions which precede the formation of the anti-knock spirits and aromatic hydrocarbons can take place with maximum yield and production of superior quality.

It is known that the principal chemical reactions for passing from paraffinic hydrocarbons with a large number of carbon atoms to anti-knock spirits and aromatic hydrocarbons are the following:

(1) Decomposition into gaseous olefines;

(2) Cyclisation of the olefines into lower saturated and unsaturated naphthenes;

(3) Dehydrogenation of the naphthenes with formation of monocyclic aromatic hydrocarbons.

These three main groups of reactions take place in the present invention in separate reaction spaces, which enable characteristic selective catalysts to be employed, in such a manner that the optimum conditions of the reaction can be realised as well as the immediate control of each stage separately.

Besides by the catalysts, the reaction spaces are characterised also by temperature, duration of contact, and pressure. By varying these elements according to requirements, and taking into account the characteristics of the primary material and those of the final product, it is possible to operate on various primary materials: crude petroleum spirits, gaseous hydrocarbons or synthetic tars, obtaining combustibles having a different physico-chemical composition. It is possible to employ selective catalysts and to vary to a maximum the working conditions (temperature, duration of contact, and pressure) only in a plant in which the reactions take place in separate, distinct and controllable spaces.

In conformity with the scheme of intermediate stages mentioned above, the process of the present invention is characterised by the following stages:

1st Stage—Cracking and Dehydrogenation

Principal reactions

(*a*) Decomposition of the heavy hydrocarbons of the petroleum fractions or of synthetic tars into gaseous olefinic and paraffinic hydrocarbons;

(*b*) Catalytic dehydrogenation of the lower paraffinic hydrocarbons into lower olefinic hydrocarbons;

(*c*) Alkylation of a part of the resulting olefines.

This stage is characterised by the following:

(*a*) Mixed catalysts which may be metallic oxides, oxides of iron, of nickel, iron and nickel combined with aluminium or aluminium oxide, as well as oxides of titanium, zirconium, cerium, alone or in admixture with hydrosilicates, as well as mineral acids (e. g. sulphuric acid);

(*b*) A temperature between 350° and 480° C;

(c) A pressure of up to 50 atm. or more;

(*d*) A time of contact necessary for the gaseous product resulting from this stage, and which is analysed, to contain the maximum yield of olefinic hydrocarbons.

2nd Stage—Cyclo-polymerisation

Principal reaction

Cyclisation of the olefinic hydrocarbons into lower saturated and unsaturated naphthenes.

This stage is characterised by the following:

(*a*) Mixed catalysts which may be oxides of vanadium, of molybdenum, metal halogen compounds (e. g. metal halides), oxides of metalloids as well as organo-metallic compounds (naphthenates of heavy metals);

(*b*) A temperature of 460° to 560° C.;

(c) A pressure below 20 atm.;

(*d*) A contact time necessary for the olefines of the gaseous product resulting from the first stage to be transformed practically completely into cyclic compounds. This may be controlled by the analysis of the product effected at the end of the stage.

3rd Stage—Aromatisation

Principal reaction

Dehydrogenation of the naphthenes intomonocylic aromatic hydrocarbons.

This stage is characterised by:

(*a*) Mixed catalysts which may be nickel in various forms, oxides of aluminium, oxides of cobalt;

(*b*) A temperature of 250° to 450° C.;

(c) A pressure of up to 15 atm.;

(*d*) A contact time necessary for the aromatisation to be complete.

The catalysts may be introduced into well-insulated reaction towers on flat surfaces or in tubes in the form of granules or adsorbed on ceramic supports.

Moreover the catalysts may be readily regenerated if care is taken that no coke deposits form in any of the stages.

The accompanying drawing represents the general installation scheme for carrying out the process according to this invention.

Referring to the accompanying drawing, the

primary material passes from the reservoir R by way of the cock r_1 and the pipe l into the evaporator E where complete evaporation takes place. From the evaporator E the vapours pass through the insulated pipe a into the furnace I connected by way of the conduit a_1 to two or more catalytic towers, A and A_1. The accompanying drawing indicates schematically only two towers. Whilst one of the towers, for example A, is carrying out its catalytic function, the other tower A_1 is devoted to reactivating the catalyst. The valves c and c_1 serve for making connection with the flue or chimney whilst the catalysis towers are being regenerated. By way of the insulated conduit b the gases which escape from the catalysis tower A pass into the furnace II, likewise connected by means of conduit a_2 to two or more catalysis towers B and B_1, operating in the same way as the towers A and A_1. Through the insulated conduit b_1 the gases which escape from the towers B or B_1 pass into the last furnace III, which is also connected through its pipe a_3 with two or several catalysis towers C and C_1.

The cocks r_2, r_3 and r_4 serve for removing specimens for the analyses carried out at each of the thermocatalytic stages I, II and III so that progress of the operation can be continuously supervised and controlled. At each cock there is connected an ice-cooled coil, each coil being in communication with a separator G, G_1 and G_2. The condensed product is separated off through the pipes n, n_1 and n_2 and the gases are collected by the pipes m, m_1 and m_2. By analysis of the liquid and of the gases coming from each stage the progress and the satisfactory conduction of the operation of the respective stages is ensured.

By way of the pipe b_2 the products pass into a separator S whence the asphaltic product which there separates can be removed through the cock r_5. The products then pass through the pipe e to a cooling coil F and cooled thus pass into the gas separator G_3. The polymer is withdrawn through the cock r_6 whilst the gases pass through the pipe f into an absorption tower T. The gas oil is conducted to the upper part of the absorption tower with the aid of a pump K by way of pipe k and the spirit rich in gasolene vapours is withdrawn through the cock r_8 and submitted to distillation. The residual gases escape through the conduit J.

If it is desired to obtain a spirit which is not so rich in aromatics, the apparatus described above can be modified in the following way:

The gaseous mixture, after leaving the furnace II, is led towards a condenser L connected thereto, to which condenser is connected a gas separator G_4 in which the condensed liquid is removed through the cock r and the non-condensed gases are re-introduced into the furnace III through the pipe b_3, after which the products follow the same course as above, passing through the separator S and so on.

The residual gases from J can be collected with a definite proportion of the gas arising from the furnace I and the mixture passed into the alkylation apparatus W. The cock d regulates the quantity of olefinic gas being withdrawn from the furnace I, which gas is then led by means of the pipe g and through the separator h and pipe i into the alkylation apparatus W. The residual gases from J are also led to this apparatus through the pipe g_1 and the separator h_1. The alkylated product is withdrawn through the cock r_9.

In this way the mixture of hydrocarbons in the vapour state traverses the heating spaces and then meets the selective catalysts and the characteristic conditions of each stage. Before entering the reaction towers the gaseous product also undergoes a molecular re-activation brought about by the various heatings to which it is submitted. The temperature therefore plays a double role.

The polymer which results is condensed and the gases are passed to the gas absorber.

Example

The primary material employed is a petroleum fraction distilling between 150° and 350° C. The following is the analysis of this fraction:

	Per cent
Paraffinic hydrocarbons	65.3
Naphthenic hydrocarbons	23.6
Aromatic and olefinic hydrocarbons	11.1
	100.00

In the first stage oxide of nickel and oxide of iron on hydrosilicate supports were employed as catalyst. The alkylising of the gases takes place in the presence of 96% sulphuric acid at a temperature of 25°–150° C. and at a pressure sufficient to maintain the products in the liquid state.

In the second stage oxide of molybdenum activated with metal halogen compounds, e. g. metallic halides, was employed, and in the final stage oxide of cobalt mixed with some nickel in powder form on supports of pumice stone.

By fractionating the polymer a spirit is obtained which, mixed with the spirit from the absorber, gives a fuel of the following characteristics:

Density: 15° C.=0.826

Distillation: commences at 42° and finishes at 185° C.; 60% come over up to 100° C.

Aromatic hydrocarbons	84.4%
Olefinic hydrocarbons	1.1%
Octane No (C. F. R.)	96

On fractionally distilling the spirit obtained aromatic hydrocarbons of superior quality can be obtained.

		Per cent
Mean yields:	benzene	20–25
	toluene	12–20
	alkyls	8–10

Yield of spirit with respect to the primary material: 72.5%

By the alkylation of the residual gases in the presence of a part of the gaseous olefines withdrawn from the first stage a spirit has been obtained having a density of 0.725 at 15° C. representing 6% by weight of the primary material and having an octane number of 91.

MARCEL NITESCU.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

M. NITESCU
CATALYTIC PROCESS FOR CONVERTING LIQUID AND GASEOUS HYDROCARBONS INTO ANTI-KNOCK SPIRIT AND AROMATIC HYDROCARBONS
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Serial No.
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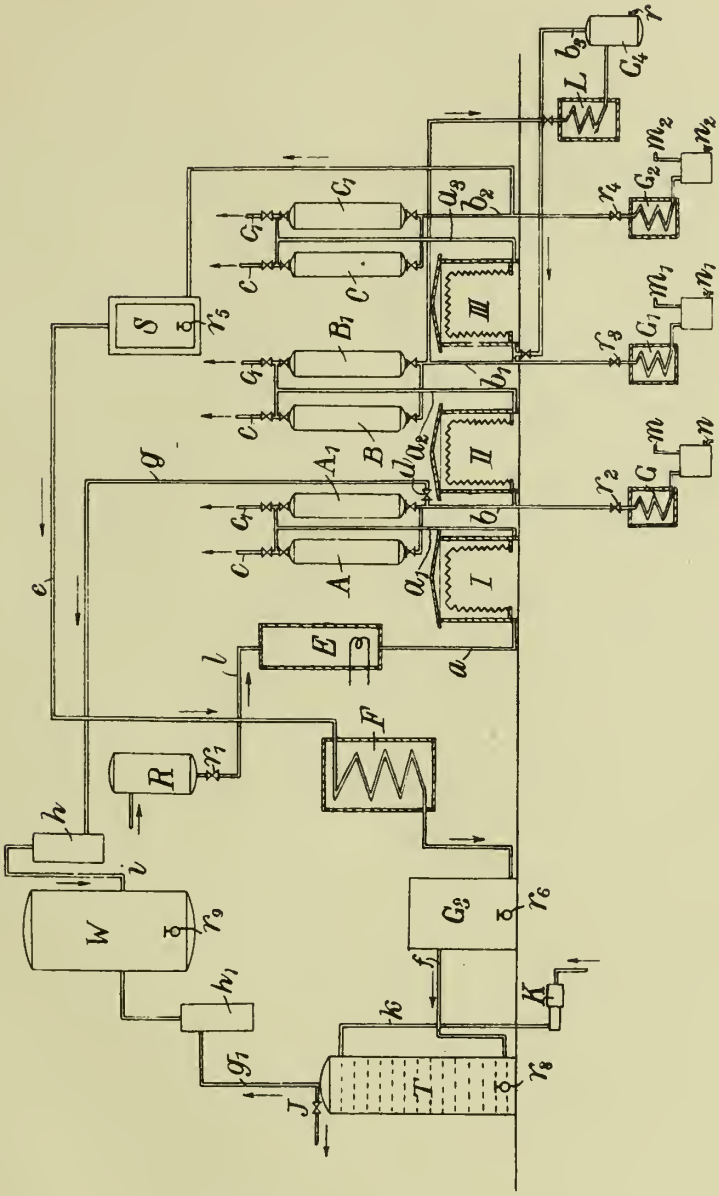

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ALIEN PROPERTY CUSTODIAN

PIEZO-ELECTRIC OSCILLATORY CRYSTAL PLATE

Rudolf Bechmann, Berlin, Germany; vested in the Alien Property Custodian

Application filed August 5, 1939

It is known that for the production of short waves, the oscillations in the thickness of piezo-electric quartz plates are utilized and for longer waves, however, the lateral oscillations of such plates. There exists a transit region approximately in the range from 800–1600 m in which the plates have a large and unfavorable thickness when utilizing the oscillations in the thickness and small transverse dimensions when utilizing the transverse oscillations. These plates are no longer suited for an exact mounting. Previously, it was generally assumed that in the case of oscillation in the thickness the ratio between the plate diameter and plate thickness should be high, and at least greater than 10:1. When using oscillations in the thickness in the transit region and applying this rule for dimensioning, very large plates are obtained which are expensive and which render the mounting difficult owing to the large mass. In the case of plates with sharp edges, or even plates whose edges are rounded off, as has been suggested, considerable disturbances are encountered when utilizing the oscillations in the thickness. The actual thickness oscillation does not consist of a single place of resonance but it has usually several places of resonance which are very near each other. This is readily understandable in view of the fact that as long as the plate in infinitely large, the state of oscillation is created in that a level wave travels back and forth inside the plate, which wave is reflected respectively at the limiting surfaces. In the case of plates in which the ratio: diameter/thickness is no longer very high, level waves which propagate inside the plates cannot even approximately be spoken off. A complicated propagation mechanism occurs in the plate which owing to the confinement through sharp edges produces a frequency spectrum.

In accordance with the invention also in the case of thickness oscillations of plates, the diameter of which is no longer large as compared with the thickness, unequivocal and single wave oscillation performances are obtained when the plates is given approximately the shape of a rotational ellipsoid, such as shown, for example, in Fig. 1. The mathematical deduction shows that a body having such a form provides an unequivocal natural oscillation. Experiments have indicated that it is not absolutely possible that the plates have the strict shape of a rotational ellipsoid obtainable only with difficulty. The oscillation performance already becomes unequivocal where the form is only in an approximate manner that of a rotational ellipsoid. A faceting with two or a greater number of radii which produces such a plate form in which more than one half of the diameter of the quartz plate is as is found from experience sufficient to produce single wave plates. Fig. 2 shows such a highly faceted quartz plate having an approximately elliptical form. It was found from experience that it is proper to grind the plate at its center into a sharp edge, Fig. 3, in contrast to the strict form of a rotational ellipsoid. This is of particular importance since in making use of the sharp crystal edge, the plates can be mounted, in a damping-free fashion, in the center plane. The center plane represents a nodal line of the oscillatory performance also in the case of the natural oscillations of the rotational ellipsoid.

The present invention relates in the main to those thickness oscillations which are determined by the conditions of shearing, hence, to plates of the Y-cut, or to plates which are inclined about the X-axis towards the Y-axis, furthermore, to plates having a small angle with the X-axis. In longitudinally oscillating plates and in the first place in the case of thickness oscillations of the so-called X-cut whose physical possibilities of production are analogous to the above, the aforementioned explanations are applicable accordingly.

The practical significance of the present invention lies in the fact that in the case of the proposed shaping, it is possible to produce oscillators utilizing thickness oscillations up to waves of 1600 meters, whereby the diameter of the quartz crystal is relatively small. Whereas hitherto for the wave range at about 1000 m quartz plates were employed which at an approximate thickness of 6 mm had a diameter of 50 mm, it is now possible to use quartz plates which have a diameter of, for instance, 30 mm. The application of the above invention permits a substantial saving of quartz material, furthermore, the volume can be reduced and indirectly the thermostats in high-quality transmitters can be made smaller.

RUDOLF BECHMANN.

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BY A. P. C.

R. BECHMANN

PIESO-ELECTRIC OSCILLATORY CRYSTAL PLATE

Filed Aug. 5, 1939

Serial No.
288,502

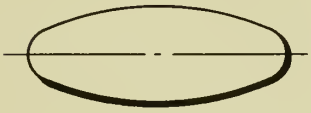

Fig. 1

Fig. 2

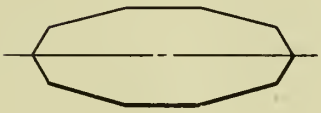

Fig. 3

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ALIEN PROPERTY CUSTODIAN

TREATMENT OF SOLUTIONS TO OBTAIN SOLID MATTER THEREFROM

Finn Jeremiassen, Oslo, Norway; vested in the Alien Property Custodian

Application filed September 15, 1939

This invention relates to the treatment of solutions to obtain solid matter therefrom and has for its object a process as well as an apparatus by means of which it is made possible to obtain the separated solid matter in the form of comparatively coarse granules. According to the invention the required increase in the concentration of the treated solution is brought about by contacting the solution with a gas.

It is known that it is possible to increase the concentration of a solution by causing a gas to act on same, by evaporation, cooling or by chemical reaction, for example by the action of a gas containing ammonia, on a liquid containing sulphuric acid, whereby sulphate of ammonia is formed. The means hitherto employed to obtain a large area of contact between liquid and gas have been either to force the gas down into the solution and allowing it to ascend in the form of bubbles, or also to cause the liquid to pass through scrubbers, in the form of cascades or as a rain of jets or drops, downwards through a flowing gas.

When it is desired, however, to carry the concentration so far as to a state of supersaturation, such as it is necessary to bring about precipitation of dissolved solids, the means hitherto employed have been found to be practically inapplicable because after a short time of operation obstructing coatings are formed on parts of the solid bodies contacting with the supersaturated solution in the gas space.

In the specification of a prior U. S. A. patent (No. 1,478,337) I have mentioned the various advantages which are attainable by operating with degrees of saturation within the metastable limit particularly, when it is desirable to obtain products in the form of coarse granules.

Coarse granular precipitates frequently present several advantages such as a lower cost of centrifugal and drying treatment, higher degree of purity (owing to the fact that the percentage of adhering impure solution is less), decreased formation of dust, decreased agglomerating and baking tendency during storage etc.

In spite of the disclosures in the mentioned U. S. A. patent specification No. 1,478,337 the problem of using a gas to bring about supersaturation in crystalizers has not until now been solved in a satisfactory manner in connection with the manufacture of comparatively large-sized crystals.

Primarily this is due to the difficulties connected with the establishment of a uniform supersaturation, which at no point shall exceed the rather narrow limits of metastable supersaturation. If the flow of liquid through the gas space is slower at some places than at others, parts of the liquid may from this reason happen to be subjected to the supersaturating effect of the gas for a too long time. Most markedly this will take place in connection with splashes causing drops of liquid to adhere to solid bodies in the path of the flowing gas resulting in the formation of finely granular salt and coatings.

I have observed that the main difficulties are due to these circumstances and the present invention is based on this observation.

An important characteristic feature of the process, which is the object of the invention, consists therein that the solution to be concentrated by contact with a gas is introduced into the gas space in an approximately saturated condition and by the action of the gas is caused to be supersaturated to a point within the metastable limits. The supersaturation so produced is thereupon released by contact with crystals of the same substance as that which it is desired to precipitate, whereupon the solution is again returned to the gas space to be again subjected to concentration to a point within the metastable limit of supersaturation.

In the following the invention is described with reference to the accompanying drawing, in which Figs. 1 and 2 diagrammatically illustrate by way of example two types of apparatus adapted to carry the invention into effect.

Referring to Fig. 1 the numeral 1 designates a pump forcing approximately saturated solution up into a container 2, having a bottom provided with holes. The liquid passing through said holes flows freely through the space 4 below said container (2). Through a pipe 5, an annular chamber 6 and openings in a jacket wall 7 a hot gas is forced into the space 4. This brings about evaporation from the surface of the liquid streams or jets which to a greater or less degree will be disrupted so as to form drops. This results in the liquid becoming supersaturated to within the metastable limit, viz. to a degree of supersaturation at which no crystals are formed.

The cooled gas flows through the pipe 8 as indicated by arrows, while the supersaturated solution collects in the hopper 9, from which it returns to pump 1 through pipe 10 and crystal suspension 11.

In continuous operation fresh solution is constantly supplied to replace evaporated liquid and deposited solids taken up on the crystals in the suspension 11. When this added solution is un-

dersaturated, it may be used to utilize the remaining heat (or chemically active constituents, such as for example ammonia) in the escaping gas by passing the added fresh solution in the most intimate contact possible with the escaping residual gas as diagrammatically illustrated in the drawing. The solution in this example is passed through a pipe 12 down into a cup 13, with holes in the wall or with overflow edge. From this cup the liquid flows downward in such a way that the escaping residual gas from pipe 8 must pass through the "veil" of liquid.

In the case of the volume of added solution being so small that it will be difficult to bring about a uniform distribution of the "veil" over the entire cross sectional area of the container, its volume may be increased by first mixing it with a part of the circulating liquid from the apparatus.

Instead of causing the added undersaturated liquid to fall freely downward, the liquid may also be brought to trickle in cascades or through a scrubber in which the residual gases ascend.

The crystals in the suspension 11 grow as a result of the supersaturation being released on them. The larger ones sink farthest downwards and are continuously or intermittently removed through pipe 14.

In the operation of the described plant no part of the liquid will be subjected to the supersaturating effect of the gas for a too long time, and there are no solid bodies in the path of the particles of liquid, on to which liquid might adhere to form coatings. The only solid body with which the particles of liquid enter into contact while in the flowing gas, viz. the bottom 3, is left by the liquid before there has been time enough to arise any substantial degree of supersaturation. Further the re-supersaturation of the liquid at each cycle is released in the crystal suspension 11, and this means that the total supersaturation at no point will arise above the metastable limit, so that the holes in the bottom 3 will not be obstructed. The fact that the gas flows inwards into space 4 further counteracts splashing from the streams of liquid on to the jacket wall 7 particularly in the case of this latter having been given a tapering form as illustrated, because the spreading or disintegration of the streams or jets into drops will increase the longer the streams have moved downward.

It is also possible to dispense with the jacket 7 because also in this case it is possible to obtain sufficient relative velocities between gas and liquid when there is provided for the production of a strong whirling motion in the gas already before it enters between the streams of liquid.

The process as explained operates with supersaturations, which are at all points within the metastable limit so that coatings (crusts) on the parts of the apparatus are avoided. This means that the supersaturation per cycle which shall give the entire production, is quite small, usually only a fraction of a percent of the entire contents of salts in the liquid. For this reason very large quantities of circulation must be employed, viz. many times as large as the quantity of liquid added per second through 12. This is an important new feature of the present process, inasmuch as it is only thereby rendered possible to employ a great number of liquid jets in the space 4, i. e. a very large contacting surface between the liquid and the gas without having to resort to the use of spray, or quite thin films of liquid as employed in scrubbers, as this would result in formation of fine salt and coatings caused by local exceeding of the metastable supersaturation, as explained above.

The method of causing liquid to fall freely down through the space through which gas is flowing, viz. without solid bodies having at any point a chance to produce injurious local non-uniform motion, is also capable of being carried into effect in other ways than illustrated in Fig. 1.

In Fig. 2 is shown as an example a modified embodiment of the invention. In this case the circulation pump 1 forces the circulating liquid through a pipe 17, provided with holes and into the space 4, through which gas is flowing.

If liquid splashes on the wall 15 of chamber 4 and this splashing is unsufficient to maintain the wall moist, the undesirable effects of the splashes can be avoided by constantly causing an auxiliary flow of liquid to wash over the wall 15, so that no part of the wall is alternately dry and wet (which would result in the formation of coatings on the wall). To bring about such continuous washing of the wall one may for example make use of a secondary pipe 16, and an annular slot 18. The main principle on which the present invention is based implies that the circulating quantities of solution, as above explained, are very large, and from this reason the employed "washing" flow of solution does not involve any appreciably decrease in the quantity of solution which is utilized as a shower of streamlets or jets.

Fresh solution is introduced through pipe 19 or for example through 16.

In order to secure a uniform distribution of the gas blown in through pipe 5 and also to obtain comparatively large gas velocities in an inward radial direction in space 4, so that jets of solution from pipe 17 shall not splash on to the walls of the chamber, an annular shield 20 may also be arranged.

It is not necessary to maintain atmospherical pressure in the chamber 4. This space may also be kept under vacuum.

As an example of fields in which the present invention can be adapted may be mentioned—in addition to the manufacture of ammonium salt above described—the crystallization of anhydrous sodium sulphate by forcing hot combustion gases through space 4, so as to cause evaporation of a part of the water in each cycle of the flowing solution.

FINN JEREMIASSEN.

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F. JEREMIASSEN
TREATMENT OF SOLUTIONS TO OBTAIN SOLID MATTER THEREFROM
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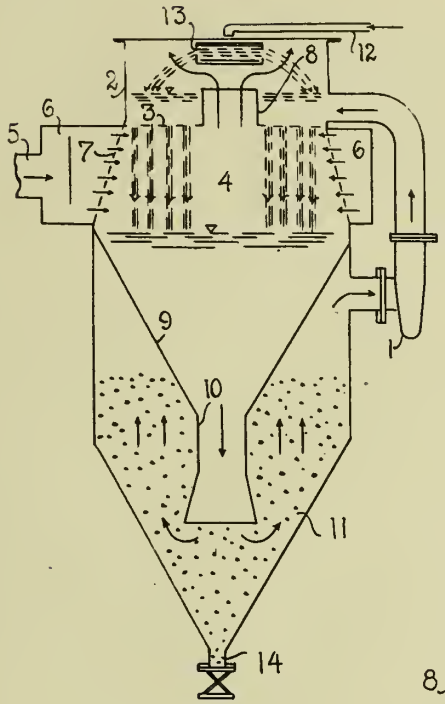

Fig. 1.

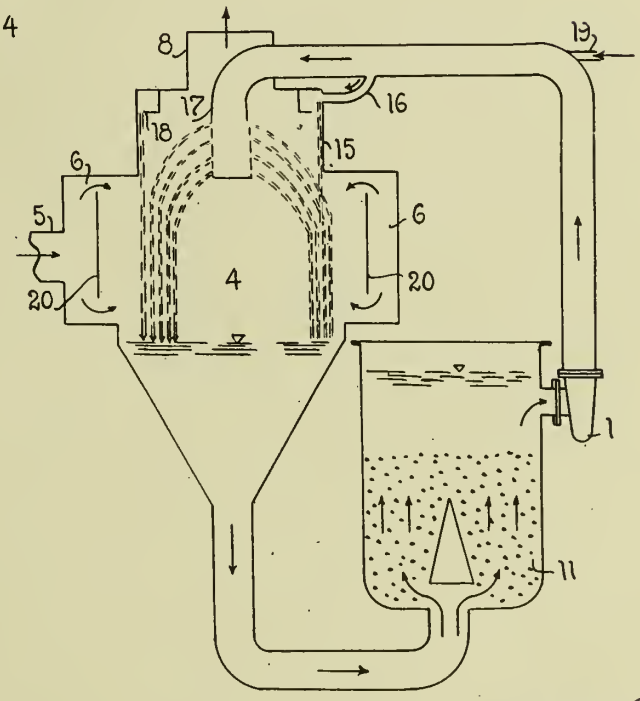

Fig. 2.

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ALIEN PROPERTY CUSTODIAN

PROCESS FOR PREPARING STARCH PRODUCTS

Meindert Danius Rozenbroek, Delden, Netherlands; vested in the Alien Property Custodian

No Drawing. Application filed December 15, 1939

It is known to prepare dextrines by heating starch to a high temperature, if desired in the presence of small quantities of acid. In such processes the raw material to be dextrinized (eventually after a diluted acid has been added) is carefully dried, thereupon heated, cooled and moistened. The degree of moistening is chosen in such a way that the same corresponds with that of the product in an air-dry condition.

I have found that valuable products are obtained if the moist starch is allowed to absorb at low temperature gaseous acid or acid in the form of vapor, preferably in larger proportions as used in the known processes. Thereupon I leave the starch to which acid has been added to itself for some time at ordinary temperature or at somewhat increased temperature, e. g. 30–80° C. In the latter case the heating is carried out for such a small period that not too much water is evaporated and that the dextrine obtained contains about as much moisture or only not much less than is desired for a dextrine of good commercial quality. Thereupon the acid is removed in part or wholly e. g. by neutralisation by means of a suitable alkaline material, after which the product is ready for use.

The advantages of my process are appreciable. It is no more necessary to dewater the starch before the dextrinizing process. In some cases, however, it may be of advantage to apply a partial dewatering, e. g. when treating potatoes which may be dewatered to a moisture content of 10%. Often it is possible to dextrinize the air-dry flour directly without dewatering. A further advantage is that dextrinizing is carried out at lower temperature and no or only a limited drying is necessary, no moistening of the dextrinized product has to be carried out and all difficulties connected with such drying are removed. The latter two advantages cause that the chance of the formation of lumps and so-called "grit" is very small.

The advantage which is of the most importance consists therein that without any heating or with a limited heating dextrines of good quality can be obtained. Further it is remarked that the products obtained according to my process are of a very light colour, lighter than those products obtained in the known way.

I shall now elucidate my invention by means of some examples, which do not limit the scope of my invention.

Example 1

Potato flour containing 20% of moisture is brought into contact with dry hydrochloric acid gas at low temperature. The hydrochloric acid gas is quickly absorbed by the potato flour. The absorption is interrupted as soon as 2% HCl is taken up by the flour. After a shorter or longer period the acid may be neutralized. If the acid is neutralized immediately after the introduction the starch is dextrinized only very little. If the product is stored a few days at normal temperature the product obtains more and more the properties of white dextrine. The dextrinizing process may be promoted by gently heating the flour, e. g. at 50° C. After a few hours already a dextrinized product is obtained possessing the same properties as to solubility and viscosity as white dextrine. When heating a short time to 80° C., e. g. during 5 to 10 minutes, a starch product of a sufficient degree of dextrinisation is obtained, suitable for the textile industry.

Instead of 2% HCl, the product may also absorb smaller or larger quantities, e. g. 0.5%, 1%, 3%, 5%, 7% or more. When applying larger quantities than 2% it is advisable in general to remove the excess of moisture beforehand.

Example II

100 parts by weight of potato-flour are dried till the moisture content is about 12%. Thereupon a proportion of dry hydrochloric acid gas of about 3,5% is introduced while keeping the flour at a low temperature. After the absorption the product can be neutralized immediately or after some time. When the acidulated material is stored at about 30° C during e. g. 15 hours a noticeable dextrinisation takes place. Heating a short time at 50° C promotes the dextrinizing process considerably, no considerable drying out taking place during the treatment.

Instead of the potato flour mentioned also other starches or starch containing substances may be used, e. g. maize or corn starch, rice starch, tapioca starch, wheat starch, glutine, containing starches, such as wheat flour. Also starches pretreated in a known way may be subjected to my process, e. g. dextrine, and starches treated with oxygen-yielding means, or with ozone, halogene, hypochlorites, alkalies and the like. My process may be also applied to cold soluble starch, swelling starch and the like for which products treatment with gas or vapor seems to be the only one possible, in as much as the treatment with liquids gives rise to the formation of lumps. Inferior qualities of starch, such as cellulose or sand containing starch, may also be used with advantage, and also flour in the form of flakes.

Instead of hydrochloric and also other acids or

acid gas or vapor yielding substances or mixtures may be used, e. g. chlorine sulphonic acid, nitrogenic acid, SO_3, PCl_3, $PO\,Cl_3$, PCl_5, SO_2Cl_2, acetic acid and the like. Some of these substances must be converted into vapor by heating.

Example III

White dextrine obtained in the known way is allowed to absorb hydrochloric acid gas (containing no or little moisture) till the product contains 2% of free hydrochloric acid. The dextrine is moistened to a water content of about 12% beforehand. The acid-containing product is left to itself for sometime (varying from half an hour to some days) after which a suitable alkali e. g. sodiumcarbonate, bicarbonate, ammoniac, is used to neutralize the acid. The product obtained in this way has been dextrinized to a far further degree than the starting material, without the colour being changed to any extent.

Example IV

British gum obtained by roasting maize starch at high temperature, after being moistened with about 10% of water, is allowed to absorb hydrochloric acid or acetic acid during half an hour at 40° C., after which the excess of acid is neutralized.

Example V

Potato starch, treated with sodium hypochlorite in the known way, having a moisture content of 15%, is treated with hydrochloric acid till 2% is absorbed. Thereafter the product is gently heated during half an hour at 45° C. after which the acid is neutralized with a suitable alkali.

Example VI

Potato starch is dried till a moisture content of about 12% is obtained, i. e. the proportion corresponding with that of the desired final product in an air-dry condition. Thereupon the product is allowed to absorb 4% of hydrochloric acid gas and the product is heated during one hour at 40° C in a closed vessel at a pressure of about 5 atmospheres. Finally the product is neutralized.

One may apply my above process with advantage by firstly treating the starch as described above, thereupon neutralizing wholly or partially, and drying in the known way, and, finally, dextrinizing further by heating at high temperature. When applying a complete neutralisation after the pretreatment it is possible to dextrinize the product further by roasting in a neutral state or after having added to the product an acid, but in a small proportion.

Example VII

Tapioca "crack" flour in an air-dry condition is allowed to absorb 0.5% of dry hydrochloric acid gas; thereupon the acid product is left to itself during 10 hours at a temperature of 35° C. The product is neutralized and is heated during a longer or shorter period at about 130° C.

As to my process described above it can be stated in general that in order to attain the same degree of dextrinizing and when using a small proportion of acid the acidulated flour must be kept during a longer time on a given temperature than in using a larger proportion of acid. When using the same time and the same temperature a more dextrinized product will be obtained when using more acid. E. g.: when using more acid during 24 hours at a temperature of 35° C a very converted dextrine will be obtained and—if a higher temperature is preferred—it is necessary to heat only shortly, shorter than when relatively little acid is used, e. g. 0.5% calculated on the weight of the flour.

I may carry out my process in agitating or mixing vessels, which may be constructed so as to be cooled and/or heated. Also conveyor troughs, conveyor belts and the like may be used. It is also possible to have the flour brought into contact with a stream of gas, e. g. in a tower. The process may also be carried out in closed vessels with or without pressure, and the heating may be carried out also in such closed vessels.

Further it is remarked that the evaporation of water is also dependent on the thickness of the layer and whether the material is agitated or not. At the same temperature and when using a thick layer of resting flour, e. g. in a silo, less water will be evaporated than is the case when using a thin layer of flour which is agitated. In such cases where evaporation is to be limited I prefer to use thick layers.

If during the gentle heating some drying out might occur then it is advisable to add some moisture e. g. by atomizing water or by introducing moist air. Adding moisture during dextrinization is not only of importance for obtaining a final product with a sufficient moisture content but also to influence the dextrinizing process. In the absence of moisture my process is slower and goes on in a different way, than in the presence of moisture.

The products obtained according to my invention posess at least the same possibilities of use as those obtained according to known processes. In several respects my products are even better, e. g. as far as colour is concerned. The salt formed by the neutralisation is no drawback in most cases, and may be even of advantage, as the product will less stick together and will less give rise to the formation of lumps.

MEINDERT D. ROZENBROEK.

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ALIEN PROPERTY CUSTODIAN

PROCESS FOR PREPARING STARCH PRODUCTS

Meindert Danius Rozenbroek, Delden, Netherlands; vested in the Alien Property Custodian

No Drawing. Application filed December 15, 1939

It is known to prepare dextrine by heating starch at a high temperature, if desired in the presence of small quantities of acid. In such processes the raw material to be dextrinized (eventually after a diluted acid has been added) is carefully dried, thereupon heated, cooled and moistened. The degree of moistening is chosen in such a way that the same corresponds with that of the product in an air-dry condition.

I have found that it is possible to improve the known process by carrying out the dextrination with large proportions of a suitable acid at such a moisture content and in such a way that after the dextrination is finished the product obtained possesses a moisture content corresponding with the moisture content of the product in an air-dry condition.

In order to attain this result the starch to be treated (if desired after a partial drying) is mixed with a predetermined proportion of a suitable acid. The acidulated flour is left to itself, during a longer or shorter period at room temperature, or the same is gently heated, e. g. to about 50° C. and at any rate not higher than 80° C. care being taken that the loss of water is no more than necessary for giving the treated final product a water content equal to that of the air-dry product. Finally the excess of acid is neutralized with a suitable alkali.

The advantages of my process are:

1. No drying or only a partial drying is necessary.
2. No heating or only a low heating is necessary.
3. No moistening of the dextrine is necessary. The final product has at once the desired moisture content which is necessary for the air-dry state of the product.
4. Formation of lumps which as a rule occurs during drying and moistening is prevented.
5. Very little decolouring of the product.
6. It is possible to use acids which would cause carbonisation at high temperature; e. g. sulphuric acid, sodium bisulphate.
7. Simplicity of the process.

My invention will now be elucidated by the following examples which, however, do not limit the scope of my invention.

Example I

Potato flour containing 20% of moisture is dewatered till a content of 4%. Thereupon 16% hydrochloric acid of 10% are added, and the product is left to itself during four days at room temperature, after which period the product is heated to 40–50° C. during a short time. Finally the product is neutralized with sodium carbonate.

Example II

Potato flour containing about 3% moisture is mixed with 12% of its own weight of a solution of sulphuric acid in water of 20%. During the mixing with the diluted acid one may cool. Thereupon the product is gently heated to 40° C. Care is taken that no or nearly no water is evaporated. Finally the product is neutralized.

Example III

Potato flour with 8% moisture is mixed with 10% of a solution of nitrogenic acid in water of 30% and thereupon the product is treated as described in Example II.

The acidulated product may also absorb acid in the form of a gas or vapour. This absorption may take place before or after a heating and before or after a cooling, but can also take place without heating.

Instead of hydrochloric acid, sulphuric acid, nitrogenic acid, one may also use other acids or acid yielding substances e. g. phosphoric acid, acetic acid, acetic acid anhydride, acetylic chloride, oxalic acid and also acid salts e. g. sodium bisulphate and the like.

Instead of potato flour I may also use other starches or starch containing products for dextrinizing the same, e. g. maize, rice, wheat, tapioca flour, and also glutine containing starches e. g. wheat flour and the like and further inferior qualities containing cellulose and/or protein. It is also possible to use starch products which have been converted by treating with oxydizing means or enzymes such as ozone, peroxydes, chlorine, hypochlorites and the like.

I may also use products pre-dextrinized in a different way as a raw material for my process. The heating may be carried out in closed vessels under pressure or without pressure, and also in agitating or mixing vessels, conveyor troughs and on conveyor belts or the like.

Further I may pre-dextrinize the starch after which I may neutralize completely or in part, dry the product carefully and continue the dextrinizing by heating at a higher temperature; finally the product is cooled and moistened in the known way.

Example IV

Potato flour is dried till it contains about 8% of moisture after which 6% of nitrogenic acid of 20% are added. The mixture is heated to 60° C.

in a closed vessel in which a pressure of 5 atmospheres is maintained. In this vessel the product is kept on this temperature during some hours, afterwards cooled and neutralized with bicarbonate.

Example V

Tapioca dextrine obtained in the known way by heating above 100° C. is mixed with 15% of a hydrochloric acid solution of 10% and the product is maintained during some hours on 40° C. Thereupon the product is neutralized.

Example VI

Maize starch treated with sodium hypochlorite in the known way is dried till the product contains 4% of moisture. Thereupon the product is mixed with 8% of a hydrochloric acid solution in water of 10%. This mixture is kept at 45° C. during about 10 hours and afterwards neutralized.

Example VII

The acidulated flour described in example II is allowed to absorb dry hydrochloric acid gas before heating and thereupon the mixture is treated as described in example II.

As to my process described above it can be stated in general that in order to attain the same degree of dextrinizing and when using a small proportion of acid the neutralized flour must be kept during a longer period on a given temperature than when using a larger proportion of acid. When using the same time and the same temperature a more dextrinized product will be obtained when using more acid. When using more acid during 24 hours at a temperature of 35° C. a noticeably converted dextrine will be obtained and—if a higher temperature is preferred—it is necessary to heat only shortly, shorter than when relatively little acid is used, e. g. 0,5% calculated on the weight of the flour. In case the moisture content of the acidulated flour is higher than that corresponding with the air-dry state of the product to be prepared therefrom in connection with the evaporation it is possible to heat to a higher temperature than in case the moisture content of the acidulated raw material is lower.

Further it is remarked that the evaporation of water during the heating is also dependent on the thickness of the layer which is heated and whether the material is agitated or not. At the same temperature and when a thick layer of not agitated flour, e. g. in a silo, is used less water will be evaporated than is the case when using a thin layer of flour which is agitated. In such cases where evaporation is to be limited I prefer to use thick layers.

If during the gentle heating some drying out, e. g. 2–5% might occur then it is advisable to add some moisture e. g. by atomizing water or by introducing moist air. Adding moisture during dextrination is not only of importance for obtaining a final product with a sufficient moisture content but also to influence the dextrinizing process. In the presence of a small proportion of moisture my process is slower and goes on in a different way than in the presence of sufficient moisture.

The products obtained according to my invention possess at least the same possibilities of use as those obtained according to known processes. In several respects my products are even better, e. g. as far as colour is concerned. The salt formed by the neutralization is no drawback in most cases, and may be even of advantage as the product obtained will less stick together and will less give raise to the formation of lumps.

MEINDERT D. ROZENBROEK.

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ALIEN PROPERTY CUSTODIAN

PROCESS FOR PREPARING STARCH PRODUCTS

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No Drawing. Application filed December 15, 1939

It is known to convert starch by means of hypochlorites. For this aim the starch is brought into contact with a diluted solution of hypochlorite and if desired a catalyst is used. In some cases the starch to be treated is suspended into a solution of a suitable alkali carbonate in water and chlorine is introduced into this solution. After the treatment has been carried out to the desired degree the starch is allowed to settle; the upper layer consisting of a solution of sodium chloride of starch are present. The sediment is washed with water and afterwards dried. The drying must be carried out with care in order to prevent the formation of lumps, hard crusts and the like. The drying is very cumbersome and a part of the starch is lost due to the formation of decomposition products which are removed by the washing-water.

I have found that valuable products can be obtained without the above drawbacks being encountered if chlorine in the form of a gas or a liquid is added to a mixture of starch or starch like products with a suitable alkaline substance such as carbonate of sodium, sodium hydroxyde in the form of a powder, potassium carbonate, borax, trisodiumphosphate and the like. The process will be elucidated by the following examples which, however, do not limit the scope of my invention.

Example I

100 parts by weight of potato flour are mixed with 24 parts by weight of crystal soda. This mixture is treated with chlorine gas in an agitating-vessel till all carbonate of soda has been neutralized. In stead of adding the sodium carbonate in bulk it is in some cases of advantage to add the soda little by little, e. g. in two or more portions as the process proceeds. Care is to be taken that during the treatment the temperature does not exceed 60° C.

After the conversion with chlorine has been finished the product may be left unaltered or the desired reaction may be given thereto by means of acid or alkali. The neutral till light alkaline product will dissolve in water clearly and after cooling the product will give no clouds or nearly no clouds. Instead of crystal soda I may use also sodium carbonate in the form of a powder or an equivalent weight of potassium carbonate. Instead of potato flour I may use also different starches such as rice, sago, maize, wheat, tapioca starch, tapioca root flour and the like. Further starches containing protein or glutine such as potato flour in the form of flakes, wheat flour and the like may be used.

Example II

100 kg of potato flour in an air-dry condition are mixed with 12 kg waterfree sodium carbonate. Thereupon chlorine gas is introduced till the reaction has become weakly acid towards litmus. Instead of adding the soda in bulk it may be of advantage to add the same gradually, e. g. in two or more portions as the process proceeds. The product mixed with ½–1½% borax forms in a 50% concentration a thin boiling solution in water.

Example III

100 kg of potato starch with 20% moisture are mixed with 8 kg waterfree sodium carbonate or 16 kg crystal soda. Thereupon chlorine gas is introduced till the reaction is weakly acid. The product obtained in this way is now mixed with ¼–1% of perborate. This flour gives a clear and colourless solution which at a boiling point in a concentration of about 35% is relatively thin.

Example IV

100 kg of potato flour with about 20% of moisture are mixed with 15 kg of trisodium phosphate in the form of a powder. Chlorine gas is introduced till the reaction is weakly acid. I may also use starchs which have been altered by roasting, i. e. dextrines. These dextrines may be obtained by means of known processes but also by means of the processes as described in my co-pending applications of even date.

Example V

100 kg of potato flour are mixed during about 4 hours with 100 g of nitrogenic acid (specific weight 1,4) to 110° C. Thereupon the mixture is cooled and moistened till the dextrine obtained contains about 12% of moisture. Thereupon 20 kg of sodium carbonate are added in two portions, chlorine being introduced after the addition of each portion till the reaction is weakly acid. The product obtained is very good, colourless and soluble in boiling water. It keeps its fluidity after cooling and remains clear or nearly clear. Also cold soluble starch, cold soluble dextrine or swelling-starch obtained by treating with alkali or by drying in thin layers may be treated according to my process. It is observed that these cold soluble products cannot be treated with liquids in as much as they would give rise to the formation of lumps so that my process possesses special advantages in this respect .

Example VI

100 kg of potato flour are treated with 2% of hydrochloric acid gas and kept on 30° C during 12 hours. Thereupon 20 kg of sodium carbonate are added in two portions (first portion 14 kg and second portion 6 kg). After each addition chlorine gas is introduced till the reaction is weakly acid. The product obtained is very good, clear and colourless when dissolved in boiling water. After cooling it keeps its fluidity and remains clear or nearly clear.

The product obtained by a combined treatment with chlorine and sodium carbonate or a different alkali may be converted further by the addition of oxydizing means, such as perborate or enzymes such as diastafor or I may subject these products to a dextrinizing action.

As a dextrinizing action I may use the usual actions or such processes as described in my copending applications of even date.

Example VII

100 kg of potato flour with a moisture content of 20% are mixed with 4–8 kg of waterfree sodium carbonate. Chlorine gas is introduced till the reaction is weakly acid. Thereupon 2% hydrochloric acid is brought into contact with the flour and the mixture is heated to 50° C. during 30 minutes.

The product obtained in this way dissolves in boiling water till 40% very easily and without colouring. After cooling it gives no or nearly no clouds. The products obtained may be used for the same purposes for which starch treated with a diluted solution of hypochlorite may be used, i. e. in the textile industry, in the paper manufacture, in the preparation of leather, for preparing adhesives and the like.

In those cases in which complete absence of salt is desired the product may be mixed with water and the sodium chloride or the other chlorides may be removed. After drying the starch product freed from salt is white, has a good taste and may be used as an addition to articles of food.

Example VIII

The product obtained according to Example VI is brought into an excess of water after which it is allowed to settle, and dried carefully. The salt-free product has a good taste and can be added to a number of well digestible food stuffs.

It is possible to carry out the dextrinizing after having treated the starch with chlorine in the presence of a suitable alkali after the flour obtained is freed from salt and after having been dried.

Example IX

100 parts by weight of tapioca flour with a moisture content of 15% are mixed with 10 parts of water-free sodium carbonate. Chlorine gas is introduced till the reaction is weakly acid. The product obtained dissolves easily in boiling water and gives a clear solution till a strength of 20%; it gives a solution like glue and is very suitable for use in the textile industry.

Example X

100 parts by weight of maize starch with a moisture content of 15% are mixed with 20 parts waterfree sodium carbonate. Thereupon chlorine gas is introduced till the reaction is weakly acid. By means of an alkaline reacting salt (e. g. borax, trisodium phosphate) the product is made neutral to weakly alkaline. The product obtained is soluble in boiling water till a concentration of 60% and at cooling gives a greasy paste with a high adhesive power and is very suitable as an adhesive in the paper industry and the textile industry.

Example XI

100 parts by weight of potato flour with a water content of 10–15% are thoroughly mixed with 5% of sodium hypochlorite with 300 g active chlorine per liter. Thereupon the product is mixed with 15% of sodium carbonate and chlorine is introduced till the reaction is neutral to weakly acid. The product obtained dissolves clearly in boiling water till a concentration of 50–60%.

Example XII

100 parts by weight of potato flour are suspended into 150 parts by weight of water which contain sodium hypochlorite with 150 g active chlorine per liter till the reaction has become neutral till weakly acid. Thereupon the potato flour is allowed to settle, the upper layer of salt solution is removed and the potato flour is dried till a water content of 25–30%. The product is mixed with 12 parts by weight of waterfree sodium carbonate and chlorine gas is introduced till the reaction is neutral. The product obtained dissolves very easily and clearly in boiling water till a concentration of 50%. The advantage of my process over the wet method is that the losses are much less as during the treatment with a small proportion of sodium hypochlorite no or only a small part of the decomposition products of the flour enter into solution, which part is lost by removing the salt solution.

My process can be carried out in agitating or mixing vessels and conveyor troughs which may be cooled. The flour can be brought into contact with a gas stream, e. g. in a tower or I may use closed vessels in which an increased pressure may be applied. The latter method is necessary in case liquid chlorine is to be sprayed onto the flour.

The treatment in the presence of alkali hydroxyde in the form of a powder can be carried out in such a way that the starch is thoroughly mixed with this substance, if desired in a ball mill and if desired a small proportion of moisture may be added. By this means the swelling power of the starch will be increased and afterwards the sodium hydroxyde may be neutralized completely or in part by means of chlorine gas. In this way the swelling promoting reaction of the sodium hydroxyde is combined with the conversion by means of hypochlorites in statu nascendi. Instead of a suitable alkali I may also use earth alkali oxydes, hydroxydes and carbonates and metal oxydes, e. g. $Ca(OH)_2$, $Ba(OH)_2$, $Mg(OH)_2$, $CaCO_3$, $BaCO_3$, $MgCO_3$, ZnO and the like.

It is observed that the temperature may not be too high as otherwise too much moisture would be removed. If desired I may add water in a finely divided condition or in the form of vapor to the reaction mixture.

It may be of advantage to use chlorine gas in a not concentrated condition but in a diluted state, e. g. mixed with carbonic acid, air or other suitable gases. I may also use solutions of chlorine in liquids, e. g. water, and also pressure may be used.

MEINDERT D. ROZENBROEK.

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ALIEN PROPERTY CUSTODIAN

MUNITION SHELLS OF ORGANIC MATERIALS AND PROCESSES FOR MANUFACTURING SAME

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Application filed January 22, 1940

The present invention relates to munition shells of organic materials for all kinds of firearms and for all uses such as petards, for example, constructed in such a manner as to respond to all the necessities of use. It also includes various processes of manufacture proposed for the production thereof. Up to the present there have been used for the manufacture of munition or like cases, for shells, bullets and so forth, metals capable of receiving the desired shape by stamping, drawing and so forth in such a manner that one portion will have a thin wall, as reduced a weight as possible and a low cost of production and on the other hand of possessing a resistance, a precision and an elasticity sufficient so as to be capable of resisting the explosion and to enable the case to be extracted easily in the case where it is employed in a firearm.

For sporting cartridges in particular there have been utilized, for the purpose of obtaining a low cost, cases of cardboard with a base reinforced by metal settings. These casings have the disadvantage of a low resistance and being very sensitive to water and moisture and of being porous.

It has therefore been proposed to form the cases of various other materials such as those with bases of acetate of cellulose, cesein, rubber, ebonite, by moulding.

Unfortunately the various processes proposed result in a material which is insufficiently resilient and resistant so as to withstand the violent and sudden forces of the explosion, or in materials of a high cost or to materials which do not enable some operations, such as the setting of the ball, or the lead for sport or of the shell and the extraction thereof after firing, to be carried out efficaciously. These processes of manufacture which have been proposed result either in materials lacking in homogenity and uniformity as regards resiliency (moulding the powder or the granular material whilst hot), or a hammer hardening of the material (moulding more or less plastic materials or materials in a humid state, whilst cold, which involves a deformation on drying).

Cellulose esters, synthetic resins, casein and so forth thus treated have only given deceptive results and in spite of the interest attached to the production of cases of this type no appreciable manufacture has been possible up to the present time. Meanwhile as the metal mainly employed for cartridges is brass, which in a number of countries is only produced in small quantities, it is of interest to replace it by a material which is available in all countries, which can easily be stocked and is of low cost; but above all this material must have the mechanical properties of elasticity and resistance, it must be resistant to humidity and heat, it should also be capable of being worked easily and to enable manufacture of cartridges in large quantities at a low cost. Finally the brass employed, besides its rarity in some countries has the disadvantage of being heavy. An alleviation in munitions is of considerable interest, it relieves the soldier, facilitates revictualling and is of considerable value for aviation. It is therefore of advantage in this sense to utilize light materials.

It may also be of advantage to use a transparent material. In fact it is often useful for the cartridge to be transparent so that its charge can be verified, which facilitates its control, thus permitting of seeing the condition of its charge. It is thus easy, besides the marks made on the base to see the quality of the cartridge and the balls and its charge in the interior. Especially in the case of sporting cartridges the transparency is particularly important as it enables a user to verify what he is purchasing and avoids errors as regards the nature of the powder, the lead and the wad. To this must be added that in this particular case, the use of a material, which is more rigid than cardboard is insensitive to moisture, entrains a considerable improvement in a sporting cartridge.

Advantageously the material employed, whatever its nature, may be easily coloured whether it is transparent or not, by the addition of colouring agents to the mass.

The colours of the material are so selected that they increase the filtering action of cellulose acetates or other organic products employed relatively to rays capable of acting on the contents of the cartridge (for example ultra-violet rays or infra red rays) so as to avoid as far as possible any destructive action on the material itself and on the contents of the cartridges by these radiations.

It is also possible to use a scale of shades with reference to the nature of the charges, the date of manufacture, the place of manufacture, the projectile and so forth.

The present invention relates to cases for munitions, for all uses, constituted particularly or entirely of an organic material which responds to all the requirements of their use and which in addition has all the qualities referred to above or solely some of these qualities.

The main feature of the material according to the invention is to combine the following conditions: high elastic limit, a sufficiently high rate of expansion so as to remain under the influence of the violent and sudden forces of the explosion in the zone of elastic deformation whilst obviating permanent deformations, frequently accompanied by fractures (inertia to shocks).

It has been found that all the materials with a base of nitro-cellulose, aceto-celulose and more generally simple or compound esters or ethers of cellulose, as also those with a base of natural

or artificial resins (coumaric phenolic, ureic and so forth), of natural or artificial albuminoid substances (casein, gelatine, fibroin, ossein and so forth) which are natural or artificial by treatment or by addition, little sensitive to the action of moisture and heat on condition that the constituents of the mixtures are suitably selected and suitably proportioned and treated so as to respond to the mechanical conditions enumerated above.

The dimensions should be suitably selected in accordance with the following considerations:—

Experience has shown that plastic cases should have dimensions different from ordinary cases of brass or of cardboard. Their dimensions should be nearer to the dimensions of the chamber of the rifle or gun.

In the case of small calibres this leads to about $\frac{1}{10}$ more in diameter.

Further the length should be exactly that of the chamber of the fire-arm for war cases where the ball is secured to the case.

In particular it is possible to employ also artificial resins resulting from:

1. either from condensations:

of the type phenol-aldehyde (phenoplastic)

for example: phenol-formol, phenol-furfurol and so forth

of the type amine-aldehyde (aminoplastics)

for example: urea formol, aliline-formol glycerophthalic resins

the superpolyamides (condensation of poly acids with polyamines, such as for example the condensation of hexanediamine with sebacic acid, pentamethyleneamine with sebacic acid and so forth)

thiothanic and arylethanic resins.

2. either products of polymerisation

coumarine and indene

of vinylic carbides (for example polystyrolenes) polyisolefines)

of vinylic esters and derivatives (such as polyacetates and derivatives, poly-chlorides and copolymers)

acrylic resins (such as metacrylate of methyl, acrylate of methyl and higher metacrylates)

butadienic derivatives (such as copolymers of butadien, polymers of chloroprene) and so forth.

It is also advantageous, according to the methods of carrying out adopted, to apply particular processes of manufacture, which also form part of the invention and which are set out hereinafter.

The question of inflammability of the material has been considered by the applicants as of secondary importance; the velocity of deflagration is such that any danger of ignition in the weapon is obviated, even in the case of materials which are more inflammable than celluloid which has been recognized as being suitable and is claimed by the applicants. Nevertheless it is preferable to utilize a material which is only slightly combustible and is practically non-inflammable for the purpose of security for storage and transport.

As a modification of the present invention it is possible on the contrary to provide an organic material for constituting the case of such a nature that it burns at the same time as charge. In this case there are used cellulose materials such as nitro-cellulose which has a degree of nitrification sufficient to be capable of burning whilst leaving only a small residue. Also in the case of artillery in particular, wherein the cleaning of the explosion chamber is easy, it will be of advantage to utilize these combustible and explosive cases which avoids the necessity of looking after used cases especially of large calibre.

For facilitating manufacture it will be of advantage to utilize a thermoplastic mass, that is to say a mass which when suitably treated and suitably proportioned may be placed in a hot mould and receive under pressure modifications in shape comparable with those of a metal stamping serving here only as a secondary means for forming the powders placed into a mould and compressed under heat by reason of the fact that there are available materials which are less elastic, less homogeneous and less resistant.

Meanwhile moulding by injection gives acceptable intermediate results.

The thermoplastic mass for the case of products composed especially of cellulose acetates contains initially also:

a. A solvent or a solvent mixture, more or less volatile, appertaining principally to one of the following groups of the aliphatic or acromatic series: Hydrocarbons (essence of petroleum, petrol ethers, benzene, toluene. xylene and so forth)

Halogenated hydrocarbons (acetylenetrichloride, methylenechloride, chloroform, chlorbenzene, dichlorethylele and so forth)

Nitrated hydrocarbons (nitromethane and so forth)

Alcohols (methanol, ethanol, butanol and so forth)

Ketones (acetone, methylethylketone, cyclohexanone and so forth).

Ethers (glycolic ethers, dioxanes and so forth)

Esters (methylformiate, ethylacetate, acetylacetic ester, acetates of glycolic ethers and so forth),

Acids (formic acid, acetic acid and so forth).

All compounds which may be solvents which can be used alone or in binary, tertiary and so forth compounds.

b. One or more plastifiers or heavy solvents which are preferably not or only slightly volatile, selected in such a manner as to increase the resistance to atmospheric agents and more generally to external agents.

c. Eventually one or more preproof agents.

These plastifiers, heavy and fireproof solvents being organic compounds of the acyclic and cyclic series with alcohol, phenol, ketone, aldehyde, amide, amine functions, ethers, esters, such as acetates (triacetine, diacetine, acetates of polyglycerides, acetates, erythrite, diacetate of resorcin and so forth) as also their homologues, derivatives and substituted products of the same chain or nucleous; chlorides, (dichlorhydrine, epichlorhydrine and so forth) citrates of ethyl, of methyl, of butyl, of amyl and so forth) of lactates, butyrates, oleates. tertrates (of methyl, butyl and so forth) ricinoleates, cetylates, stearates (butyl stearate for example); adipates (of methyl, ethyl, cyclohexanol, methyl adipate of methylcyclohexanol and so forth); phthalates (of methyl, ethyl, butyl, benzyl and so forth) of phosphates (of methyl, ethyl, butyl, phenyl, cresyl, urea and so forth) as also their substituted derivatives (chlorophosphates) for example: paratoluane sulphamide, ethyl paratoluene sulphamide and their homologues or derivatives, heavy alcohols (benzyl alcohol, cetyl alcohol, cyclohexanol and

so forth); dicresylene, synthetic gums or resins (glycerophthalic gums and so forth).

The various products which have been mentioned do not in any way constitute limiting lists.

The primary material and the various additions should be selected in such a manner that after the usual operation of kneading of the plastic material and suitable drying, the resultant material remains perfectly indifferent to atmospheric and external agents as also to ageing.

Experiments of the applicants, especially with cases of materials with a base of cellulose acetate, have enabled them to establish that for obtaining a satisfactory result it is necessary for the material employed to satisfy the following conditions which constitute a feature of the invention.

1. Have a proportion of acetyl above 48% preferably in the neighbourhood of 53% (diacetate); and in the neighbourhood of 59% (triacetate) (it is known that the maximum proportion is 62.3%).

2. In the constitution of the mass there are allowed to intervene various plastifiers, binders or loaders in the smallest possible proportion so as to obtain the desired result by the addition of each plastifier, binder or loader. In fact the addition has as a result to reduce the life of the final product and consequently its elastic limit. The process therefore consists in reducing the plastifiers, binders and loaders and even to omit them whenever it is possible.

This feature does not apply to the volatile solvents as the said volatile solvents do not exist by reason of the fact that they are easily eliminated by drying.

It is to be noted that it is generally necessary to add a plastifier or a heavy solvent in as little an amount as possible according to the plastic nature of the material for producing the mass and for kneading it.

When according to another method there is used a certain quantity of volatile solvents for forming the mixture the said solvents are eliminated at the desired moment by evaporation and subsequent recovery, and in certain cases it is possible to reduce to an extremely small proportion the plastifiers or heavy solvents by utilizing the thermoplastic properties of the product before the complete expulsion of the volatile solvents, the expulsion of the remainder of the solvent taking place whilst the article remains in a shape ensuring the precision of the finished product. This method is particularly applicable to the case of a material with a high degree of acetyl such as triacetates.

The applicants have found that the products with a base of acetate of cellulose, according to the invention, should have, before working and drying, a composition comprised between the following limits.

	Parts
Cellulose acetate of a suitable degree of acetyl	100
Volatile solvents	50 to 400
Plastifiers from	5 to 30
Fireproof substances (not indispensable from)	0 to 15
Soluble colouring agent (eventually) from	0.01 to 0.5

By way of indication there are given some formulae of compositions which have been tested by the applicants and which have enabled them to obtain thermoplastic materials after kneading, rolling, drying and so forth, adapted to produce by processes of manufacture which will be described hereinafter, cases for munitions according to the invention.

Example 1

	Kilograms
Cellulose acetate	100
Triphenylphosphate	9 to 11
Monoethylparatoluenesulphamide	9 to 11
Triacetine	10 to 12
Glycerine	0.5
Acetone	20
Alcohol	15
Benzine	32
Soluble organic colouring agent (eventually)	0.05

Example 2

	Kilograms
Cellulose acetate	100
Paratoluenesulphamide	2 to 5
Monoethylparatoluenesulphamide	10 to 15
Triphenylphosphate	7 to 12
Methyl phthalate	3 to 5
Acetone	40
Alcohol	20
Benzine	40
Soluble organic colouring agent (eventually)	0.05

Example 3

	Kilograms
Cellulose acetate	100
Chlorethylphosphate	3 to 5
Diacetin	5 to 8
Benzylic alcohol	1 to 3
Methylene chloride	400 to 60
Absolute ethanol	30 to 50
Soluble organic colouring agent (eventually)	0.05

The content in plastifiers may be considerably greater than that indicated above when dealing with certain products such as cellulose acetates or their complex esters (acetonitrates, acetobutyrates, acetopropionates and so forth).

In fact the applicants have found that it is possible for products of a high specific viscosity and more generally of good quality from a physical and mechanical point of view, to increase the proportion of plastifiers and loaders in very substantial proportions, up to 100 of these products to 100 of cellulose ester and this whilst maintaining the limits of elastic and plastic properties necessary for the satisfactory use in the barrel of a firearm of the case obtained.

In this case the rate of elastic expansion is increased without the limit of elasticity (yield point) dropping too low.

The composition of the final product may therefore enter the following type.

	Parts
Cellulose acetate of a specific viscosity above 200 poises (proportion of acetyl 55 to 60)	100
Plastifiers and heavy solvents	5 to 100

There is taken for example the following final composition:

	Parts
Cellulose acetate	100
Triphenylphosphate	15 to 30
Tricresylphosphate	15 to 30
Ethylparatoluenesulphamide	20 to 60

For a total of 80 to 85 parts of plastifiers (one of the plastifiers may however be omitted or replaced).

The processes of manufacture utilizing the above mentioned products may be varied considerably. Nevertheless they may be summarized by stating that cartridge cases may be obtained by a suitable shaping which, according to the case, may be casting a molten material, moulding under pressure plastic or thermoplastic masses having a more or less high viscosity, moulding by compression or injection powders for moulding or injection or materials which are liquid, viscous or not, drying concentrated solutions and so forth.

Here is a formula of a powder to be employed in the process by injection. This powder is composed in the following manner.

	Parts
Cellulose acetate	50 to 60
Triphenylphosphate	3 to 5
Monoethylparatoluenesulphamide	5 to 10
Triacetin	3 to 5
Glycerine	0 to 0.5
Acetone	250 to 500

It is heated and precipitated by water or any other precipitating agent as the volatile solvent distils.

It is to be observed that the invention claims specifically the employment of moulding by injection for the manufacture of moulded parts of organic materials, the material in powder or grains being liquified by the action of heat, then subjected to the action of a piston which injects it into the mould.

Experience has shown that there are thus obtained moulded pieces in a single piece, as also in two pieces, which can be utilized immediately.

The invention is applied so that the case is formed entirely of these materials or only a portion thereof is thus formed. Tests made by the applicants have shown that sporting cartridge cases behave particularly well when they are constituted entirely of the above mentioned materials.

The same is also the case for some shell cases. In the case where the case is formed of two pieces for example, in the case of cartridges for weapons of small calibre, the base is advantageously of metal. It has already been proposed to make cases in two pieces but there are certain difficulties in securing the metal part to the body of the case. In particular a process proposed, which consists in surrounding the base by the case, is not satisfactory as the explosion separates the case from the base. There are leakages of gas towards the rear and difficulties also arise in extracting the case. The applicants claim the arrangement which consists in having a metal base of a certain height which surrounds the body of the case of organic material at its base. This constitutes a binding of the case at its base which strengthens it, on the other hand the explosion wedges the body of the case into its base and thus fluidtightness is ensured as also the cohesion of the whole for extraction.

For reducing the cost of production, when the case is made of two pieces, there may be substituted for the expensive plastic material of the part forming the base, an embedded core of cheap products: cardboard, felt, compressed fabrics or cotton, moulded materials of low cost of the type of invoirine or the like.

Finally the core may with advantage be moulded previously to a shape near the final shape.

The applicants have found that in the case where the case is of plastic material the base may easily be constructed of an alloy of light metals such as aluminium, which ensures great lightness to the munition. There is claimed as a new process the case formed of plastic materials with a metal base of an alloy of light metals such as those with a base of aluminium, magnesium and so forth.

The securing of the various parts of the case may be effected by screwing, the metal portion forming the base being screwed on a screw-threaded base of the body.

This metal portion may also be secured by adhesion with or without mortising. In the case of mortising, the base of the case of suitable hard material, preferably fitting into the metal part, may be conical or be provided with a groove for ensuring a better hold of the whole.

There is also provided in the case where the upper collar mortised on the ball or on the shell may be liable to slip slightly and to remedy this the edge is fitted with a metal ring which may be held simply by adhesion or by screwing or by mortising on the body of the case, so as to avoid any fracture of the base, the finished cartridge should engage between the upper collar and the skirt of the base.

The securing of the ball when dealing with a projectile forming part of the case, is relatively easy when there is provided a metal ring on the upper collar. It is then possible to operate in the manner usual with brass cases.

However there is advantageously provided for profiled balls, which have a smaller diameter at the rear, an additional annular thickness on the base of the shell of organic materials so as to form a collar against which the more constricted portion of the ball bears, which gives a rigid securing. This same excess thickness may be provided in the case where there is not used a metal ring on the collar of the case.

For convenience in manufacture it is easier to shape separately the mass of the base and the tube forming the body of the case. Tests have shown that when a base of metal or even of a more resistant plastic material, is to envelope the outside of the body of plastic material, it is advisable to shape the body of the case by starting from a tube of plastic material, obtained for example by drawing, the said body then receiving its final shape, at certain points, either by hammering whilst hot or under mechanical pressure or by moulding whilst hot, such as moulding under steam pressure, or by modelling whilst hot, or by any other mechanical treatment for shaping whilst hot and the said body is completed in its parts which are the thickest with additional pieces of analogous material which may be obtained in the same manner or by simple moulding or in any other manner.

Thus the body of the case receives a base which is of metal or of organic material (preferably harder than the material forming the body) and eventually inserted parts of organic material of suitable hardness for reinforcing the body at certain points, as for example, the lower part in sporting cartridges, the lower part and the upper collar in the case of a case for a ball cartridge for war purposes or otherwise.

Advantageously, for facilitating the manufacture, it has already been stated that it is preferable to start with materials sufficiently thermoplastic so as to be capable of receiving under heat and pressure the exact form desired. For making the body of the case the operation is

started with a tube of thermoplastic material of the nature of those defined.

It may also be formed in a press. It may also be formed by modelling on a rotating mould, the thicknesses being regulated by a calibre. The modelling may also be effected, the part on the mould being stationary and the rotary modelling tool being guided by a rotary calibre. The modelling is preferably effected under heat. However the simple heat of friction of the tool may be sufficient for modelling.

The materials proposed can be worked mechanically almost in the same way as metal, the processes of manufacture by turning being capable of being applied satisfactorily to the whole or a portion of the article.

In the case where the case is formed by a number of parts the various elements may be gripped mainly by adhesion, either alone or in combination with screwing, mortising in the cold or under heat or joining by force in the cold or under heat. The adhesive to be employed is different and adapted to each case special glues for uniting pieces of plastic material amongst themselves or pieces of plastic material with metal pieces.

Finally the manufacture may be effected by starting with materials which are still malleable by reason of the fact that they contain volatile solvents. The shaping is effected in this case in moulds under pressure, preferably during the drying of the material after its manufacture. The drying of the piece should then be terminated on a mould so that there is no further deformation, the volatile solvent may be recovered.

The accompanying drawings show examples of constructing cases according to the invention.

In Fig. 1 there is shown a case of organic materials according to the invention which presents at the bottom a screw-threaded portion **2** and on the collar a screw-threaded portion **3**. On the part **2** there may be secured, by screwing, a metal base **4** which naturally has a larger base **5** with a suitable hole for the introduction of the cap at **6**. On the screw-threaded part **3** of the collar there may be secured, by screwing, a kind of ring **7** which protects the edges of the collar **3** and prevents them from expanding.

A case thus formed is particularly applicable for the preparation of munitions of war with the securing of the ball in the collar **3**.

Fig. 2 shows in section a profiled ball **8**, that is to say having a portion of smaller diameter at the rear at **9**. The body of the case **1** is provided with a base **4**, as indicated above, but which at the top, on a level with a collar and inside, is provided with an additional annular thickness of organic materials at **10** against which the base of the ball **8** bears in such a manner that the tightening of the ball and its securing may be effected in a suitable manner. This tightening is naturally facilitated by the presence of the ring **7** as indicated above.

It is possible to use for the metal part any suitable metal; advantageously for example the lower base may be made of aluminium whilst the upper ring may be of brass for facilitating the securing of the ball. For sporting cartridges the parts of the metal base may be constructed according to known technology in this type of manufacture with a suitable adaptation to the nature itself of the body of the cartridge of organic materials.

Figs. 3 to 9 show modifications in mounting.

Fig. 3 shows a body **10** of material according to the invention with a reduced screw-threaded lower portion **12** and an upper screw-threaded portion **11**.

On **11** there is secured the collar of the shape **13** and on **12** there screws the base **14**.

Fig. 4 shows a body **5** with a collar formed integral therewith and constricted at **16** for receiving the ball as is well known. On **12** there is also screwed the metal base **14**.

Fig. 5 shows the body **17** with a smooth constricted lower portion **18** which enters the smooth base **19**, the securing being effected by adhesion.

Fig. 6 shows a smooth base with a groove **21** near the body in such a manner that the base **22** which has a thicker rim **23** may be secured by tightening, the excess thickness **23** serving to engage the groove **21** and to give the whole the shape at **24** in Fig. 7 without the excess thickness reducing the section.

Fig. 8 shows a truncated end which enters by **25** into the smooth base **26**, the tightening pressing the base inwardly against the truncated portion at **27** (Fig. 9) in such a manner as to obtain a unit of the same section throughout its length and towards the base. A clearance **27'** enables the tightening of the base.

Fig. 10 to 13 show methods of construction of sporting cartridges or projectile cases separately.

Moreover for cases for separated projectiles and in all the technology of sporting cartridges, the construction indicated in Fig. 17 is also applicable. For shell cases all the technology of cases with an attached base is also applicable.

Fig. 10 shows that the body **25** of the cartridge has a groove **29** at the rear which enables the base of low height **30** to be secured thereto by tightening and pushing the metal material of the base into the said groove as shown at **31** (Fig. 11).

Fig. 12 shows a device of the same type but in which the bottom of the cartridge has a truncated shape **32** which enters the metal base **34** of such shape that when tightening as indicated at **34** the material forced in fills completely the portion left free by the truncated portion **32**.

Figs. 13 and 14 show sections of cases formed of three pieces. The third piece (the base) is not shown in Fig. 15.

As will be seen in Fig. 14 the body **35** of the cartridge is a drawn tube of cellulose diacetate or triacetate, of satisfactory resistance so that when the body is subjected to expansion at the moment of firing, this body is sufficiently rigid so as not to stick completely in the interior of the chamber.

In the bottom of this body **35** there is secured by adhesion or otherwise, a member **36** which is of any suitable material and shape (moulded material which if desired may be of less resistance than the body or may simply be of cardboard moulded or not or the like). This assembly **35—36**, is completed by the metal cap **37** which is tightened in position as shown at **33**.

There is thus obtained a cartridge formed of three parts. However without departing from this feature if there is employed a base of iron, for example, this iron may be covered with a thin film of brass for example, not shown, but this film does not form a fourth piece as it forms a portion so to speak of the base.

In Fig. 15 there is shown the body of a case **38** obtained by drawing cellulose diacetate or triacetate. At the end **39** (shown in chain-dotted lines) there has been formed a constriction with thinning in such a manner as to obtain finally the neck **40**. At the lower end in the interior of the body **38** there is secured, for example by adhesion,

another tube 41 which forms a lining or excess thickness in such a manner that there may be machined thereon the screw-thread 42 in the thickness of the end 38 whilst retaining a sufficient thickness at the said end. It is known that on this screw 42 there is screwed the metal base.

As will be seen, according to the invention, the end of the case enters the interior of the base. The same would be the case if the securing were effected by crimping according to one of the constructions described above, the lining tube 41 serving to give greater rigidity to the end and there is thus obtained a case which, according to the invention, is constituted by three parts (the base is not shown in Fig. 15).

According to the invention there may be imparted to the cases for sporting cartridges a shape of equal resistance in the vicinity of the base in such a manner that the explosion which occurs is not liable to simply detach the base from the tube as is liable to occur.

Fig. 16 shows a section of a case of this character in which there is shown a case formed of a single piece but which may obviously be formed of a number of pieces. The bottom of the case 43 is in the form of a hollow body of revolution of which the curvature 44 is substantially of the same order as that of a solid of equal resistance to the mechanical forces which increase whilst starting from one end of the piece. There will also be seen at 45 a shoulder between the tube and the part 43, this shoulder being adapted to form a kind of seating for the wad which is placed above the enclosed powder, in principle in the space 46 whilst the shot is assembled in the space 47.

As stated Fig. 16 shows a cartridge in one piece but it will be obvious that it may be formed of two parts, the tubular part 48 being manufactured from a drawn tube, as above described, whilst the part of the cap 43 is manufactured in a mould by means known in the technology of moulding plastic materials in the form of a solid material or from powders which are moulded or injected.

It is also possible according to the invention to give a particular shape to the tubular portion at the point of attachment to the portion forming the base in such a manner as to completely solidarize the two parts once the manufacture has been completed and to avoid any detachment at the moment of firing the shot and facilitating the extraction by causing the extractor to act on a collar of the tube itself.

Fig. 17 shows a case constructed in this way from two parts: the tubular part 49 and the part forming the base 50. As will be seen in the drawing the part forming the base 50 is provided at the rear with an annular chamfered portion 51 in such a manner that when the tube 49 and the part 50 are assembled under pressure and heat in a mould the end of the tube 49 is offset under the chamfer 51 and naturally is extended at 52 so as to form a collar. In this manner there is obtained an excellent hold of the tube and of the base at the moment of firing the shot and on extraction. It is also possible to make the tube 49 solid with the part 50 by providing a certain number of perforations (this arrangement however, is not indispensable), such as 53, on the tube adjacent the part 50 in such a manner that when moulding under heat and pressure the material of the portion 50 enters these orifices 53 and thus forms holding pins which contribute in rendering the part solid. It is possible to assume various other methods for securely connecting the two parts together.

The idea of holes is applicable to metal bases, not only for ensuring a better connection, but also for forming vents for the escape of air during moulding.

The invention also proposes to reinforce the base of the case in such a manner that when the cap is struck it cannot damage the organic material which is thus subjected to intense heat and which is liable to melt or even to volatilize. For this purpose and also for preventing detachment of the base at the moment of extraction there is provided a metal lining in this part.

The first means which come to mind consist in providing on the base and if necessary in the seating of the capsule a more or less thick film of metal according to known technology. It is possible advantageously to proceed in another way as shown in Fig. 17 in which the device is applied to a war cartridge.

It will be seen that the base is secured to a metal part itself forming a collar at 44 which forms a sleeve at 45 for the reception of the capsule and which is expanded at 46 so as to render this reinforcement and the body of the case perfectly solid.

In this manner there has been solved the problem of protecting the organic material 47 from the ignition flame and also the solidity of the collar 44 for the purpose of extraction.

Finally the invention also consists in imparting to all the types of cases for munitions of war shapes avoiding, during moulding under pressure of plastic materials especially by the use of a drawn tube which is then softened by heat and pressed against the wall of the mould for example by the pressure of a gas, any sectioning of the material and any too thin thickness which is liable to occur when the portions of attachment of the various sections do not possess a progressive form and form more or less acute angles.

A case for a munition of war constructed in accordance with the invention is shown in Figs. 19 and 20.

In Fig. 19 it will be seen that the tube 58 which forms the body of the case, has been obtained by means of a drawn tube placed into a shaping mould, heated in a suitable manner and then applied under pressure, preferably of a gas or liquid against the wall of the mould and along a uniform thickness as the profile has been selected without a sudden change of direction. It will be understood, as will be seen in Fig. 20, that the cap 61 which is connected to the part 58 has the same chamfer 62 but in the opposite direction in such a manner as to be applied effectively against the annular part 60.

The moulding of the tube may be effected on the base itself which then forms one of the ends of the tube. In this case the screw-thread 59 may be replaced by a shape forming a dovetailed section (as at 27 in Fig. 9) or any other arrangement such as the annular openings such as 63 (Fig. 21) which ensure a satisfactory connection of the two parts.

Openings should preferably be provided. These are small holes which are very weak or more important than those only serving for securing.

It is necessary in this method of manufacture to apply, in a fluidtight manner, the plastic portion of the case in its metal base before blowing.

The applicants have found that this result is obtained for example by taking the tube of drawn plastic material of the same external diameter as

the internal diameter of the metal base and gluing the two pieces together. The gluing may be effected by coating the ends of the plastic tube with a special glue and introducing it with slight force into the base. The glue should be a solution of high concentration and with relatively low viscosity (of the plastic material suitably plastified by dissolution in a solvent of which the dissolving action should be modified by a certain quantity of diluting product).

In the case where the plastic material has a base of cellulose acetate for example, the glue may have the following composition:

Plastic material used ---------- kgs --	10 to 20
Acetone or methylenechloride ---- litres --	70 to 90
Absolute alcohol ---------- litres --	10 to 30

These proportions only constitute an example, the concentration of the plastic material may vary from 0 to 30%.

For the mounting it is mainly necessary to provide for the securing of the cap in the base and of the ball or of the closing wad in a sporting cartridge.

Experience has shown the applicants that the cap can be secured easily by means of an adhesive when the base is of plastic material. This method of securing, which is easier than a force fit generally employed, also has the advantage of ensuring satisfactory fluidtightness. It may be employed in combination with a force fit or tightening.

The securing of the balls must satisfy certain conditions of rigidity and resistance to detachment which can be obtained by a tightening under heat under conditions similar to those for tightening metal cases.

Tightening is not obtained either under heat or with the assistance of a solvent except on conditions that the crude initial tube from drawing is itself of smaller diameter.

In fact the plastic material has the property when it is heated or when it is placed into a plastifying solvent to return to its initial size. There will therefore take place a tightening if the initial tube has an internal diameter less than that of the ball. Automatic tightening will thus take place either under heat or by reason of the presence of the solvent or of a glue containing a solvent.

The applicants have also found that this result is obtained more simply and at the same time, without there being any danger of breaking the collar of the case for ball and shell cases, by the use of an adhesive which must in the first instance permit by drying a contraction of the collar of the case producing a tightening of the projectile, in the second case a filling of all the pores of the metal surface in contact without however ensuring complete adhesion. It is characterized in that:

1. A solvent of the organic material employed which may be rendered more consistent by the preliminary dissolving of a binder, more especially of a product constituting the case.

This solvent more or less penetrating the organic material, which is subsequently eliminated by drying, is for the purpose of adapting the collar by modifying in a suitable direction its elasticity which comes into play from the commencement of firing for the purpose of avoiding fractures or cracks of the said collar.

2. A product attacking the slight corosion of the metal constituting the parts to be fixed to the plastic mass and compatible with the first constituent and the plastic mass itself.

3. A material serving the part of a dry lubricant on the surfaces of the metal part in contact with the plastic mass and compatible with the preceding constituents.

It is by combining these conditions that the applicants have been able to secure easily the projectiles to the cases whilst ensuring for their securing the necessary resistance.

An example of the composition of the adhesive of the character tested by the applicants and suitable for cases formed of a base of cellulose acetate is the following:

	Parts
Acetate solution at 5% in acetone ----------	8
Crystallisable acetic acid ----------	1
Solution of gum lac of 4 to 8% in alcohol ---	1

For closing sporting cartridges the applicants have found that when using the usual tightening machines, by causing them to rotate sufficiently fast for heating the upper edge of the cartridge, there is obtained a tightening similar to that of cardboard cartridges. This process has the disadvantage that the collar breaks at the commencement of firing and the cartridge cannot be re-used.

The applicants have found that by placing on the lead a washer of plastic material and soldering it to the walls by a gum simply adhesive as that described above for securing the balls to the case, there is thus ensured a sufficient securing for holding the charge and it is detached when firing without destroying the cartridge. Further there is thus ensured the fluid-tightness of the cartridge and its satisfactory preservation even in a humid locality.

The applicant also proposes to obtain for the upper portion of the cartridge a softer material by a bath of a heavy solvent which will plastify sufficiently the edge of the cartridge so as to enable it to be tightened in the same way as a cartridge of cardboard and for avoiding breakage of the collar when firing.

JACQUES TRICOU.

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BY A. P. C.

J. TRICOU
MUNITION SHELLS OF ORGANIC MATERIALS AND PROCESSES FOR MANUFACTURING SAME
Filed Jan. 22, 1940

Serial No.
315,074
4 Sheets-Sheet 1

FIG. 1

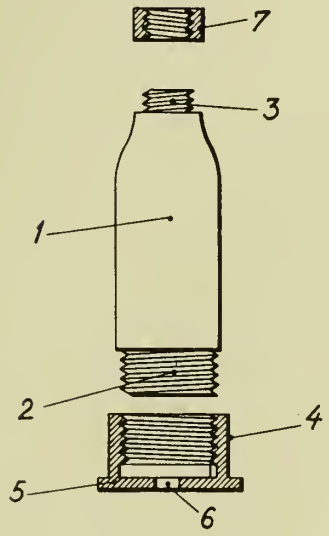

FIG. 2

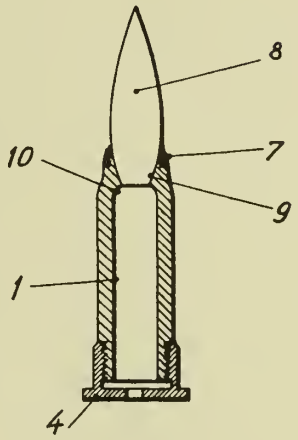

FIG. 3

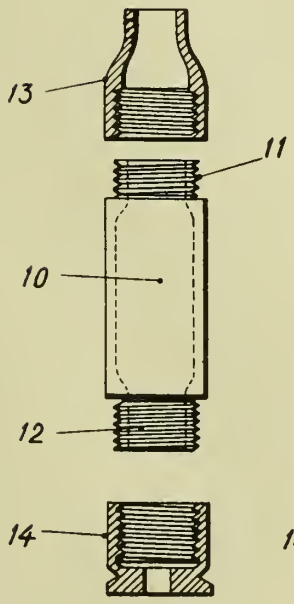

FIG. 4

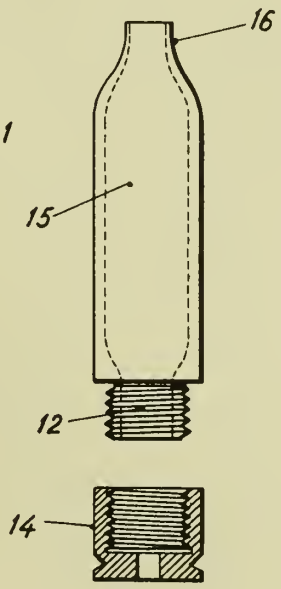

FIG. 5

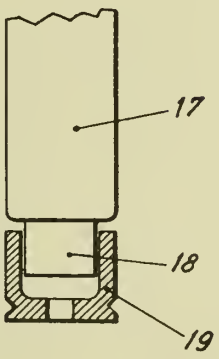

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FIG. 6

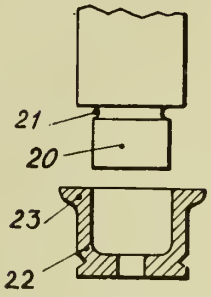

FIG. 7

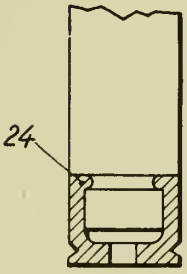

FIG. 8

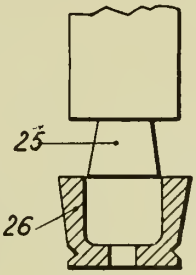

FIG. 9

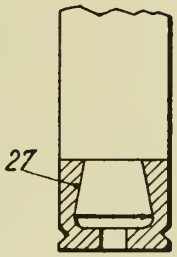

FIG. 10

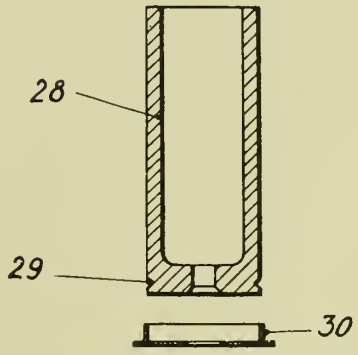

FIG. 11

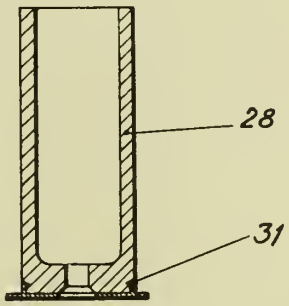

FIG. 12

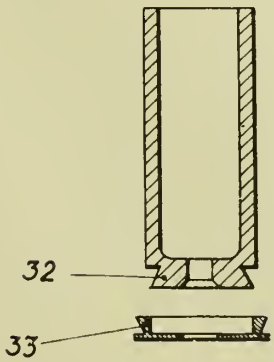

FIG. 13

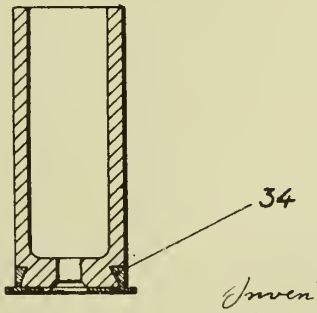

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FIG. 14

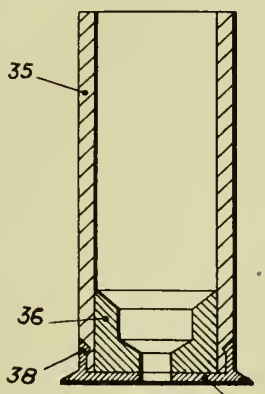

FIG. 15

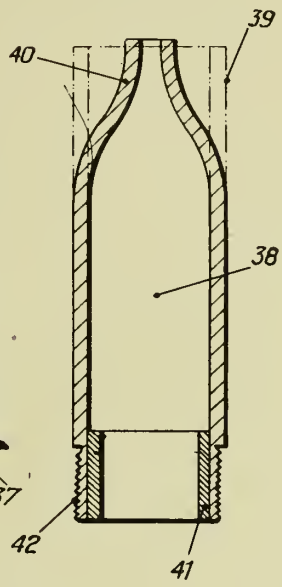

FIG. 16

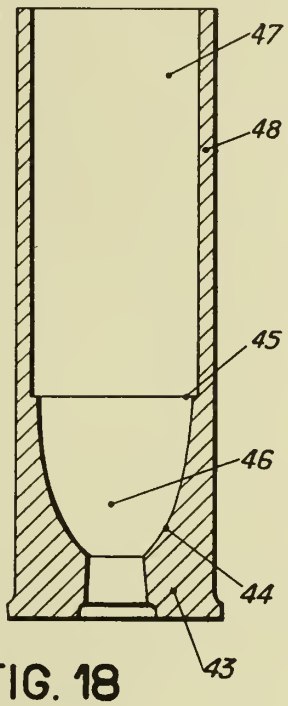

FIG. 17

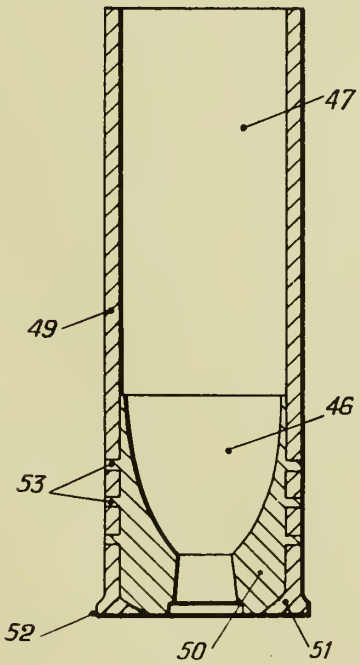

FIG. 18

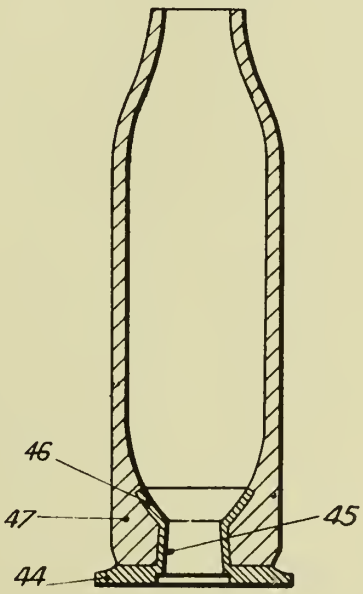

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FIG. 19

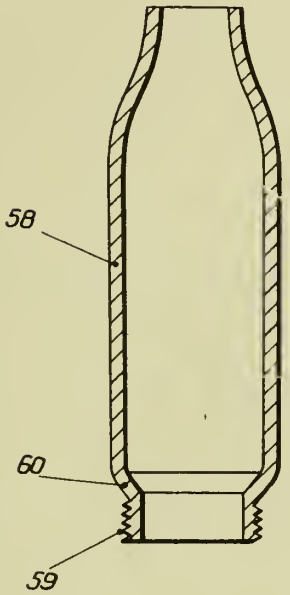


FIG. 20

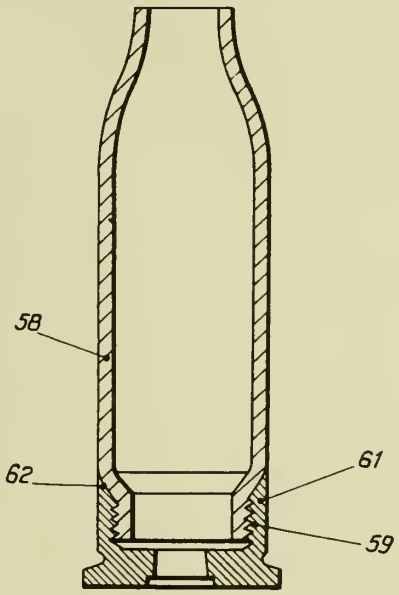
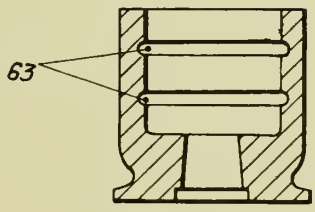


FIG. 21



Inventor:
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Published June 22, 1943

Serial No. 315,716

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE DISSOCIATION OF FATS

Italo Curletti and Pio Martini, Milan, Italy;
vested in the Alien Property Custodian

Application filed January 26, 1940

In the U. S. A. patent application Serial No. 255,603 a process for the dissociation of fats has been described, in which an emulsion of water and fat is caused to pass continuously through a tube, for instance in the form of coil, in which a high pressure and a high temperature are kept constant.

It has now been experienced that the process can be operated with greater speed and completeness if the single tube is replaced by a number of tubes having a relatively small diameter, connected in parallel by two collecting tubes of a proportionally larger diameter; in this manner one succeeds in increasing the advantages already pointed out in the above patent application, especially as far as the large subdivision of the mass and the large surface of transmission of the heat to the mass are concerned.

In the annexed drawing, 1 shows the charging collector and 2 the discharging collector, whilst 3 indicates the tubes of small diameter connecting these two collectors; the mixture of fat, water and catalyst, previously obtained according to the pending patent application mentioned above, is introduced by means of a compressor into the stated apparatus, heated in an oil bath; it enters the collector 1, is distributed along the tubes 3 and leaves the apparatus by means of the collector 2 after the reaction has taken place. Subsequently the fatty acids and the glycerine containing water are separated as described in the U. S. A. patent application Serial No. 255,603.

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PIO MARTINI.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

I. CURLETTI ET AL

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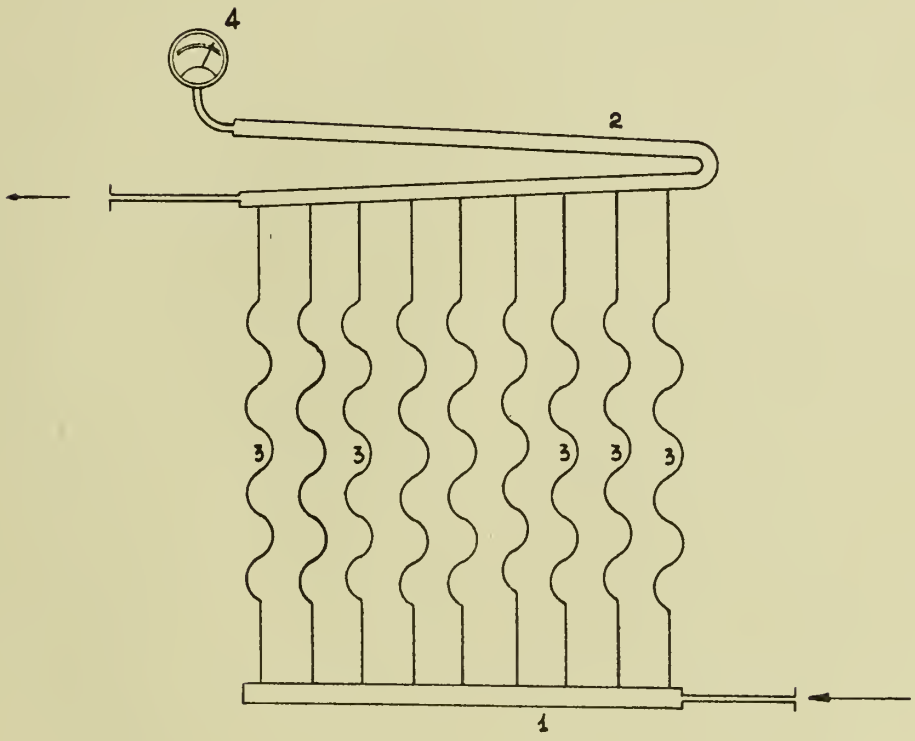
Filed Jan. 26, 1940

Serial No.
315,716



Inventors
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by Knight Bros
Attorneys

Published June 22, 1943 Serial No. 320,175

ALIEN PROPERTY CUSTODIAN

PROCESS FOR MANUFACTURING PILE FABRIC SUCH AS CARPET

Genkichi Niki, Shibuyaku, Tokyo, Japan; vested in the Alien Property Custodian

Application filed February 21, 1940

This invention relates to a process of manufacturing pile fabric such as carpet comprising rotating a cylinder on the periphery of which an original design is stuck, rotating simultaneously a holder tube in which one single bar or two bars joined together are inserted, so that said bars rotate together with said holder tube while the bars are moving forwards gradually through said holder tube, winding threads of one or more than one kind or color round said bars in order according to the patterns and colors of the original design in the file indicated by an indicator secured at a suitable place each time the original design on the cylinder completes one rotation, moving said cylinder forwards by one file in the same direction as the movement of the bars each time it completes one rotation, replacing said bars with others, and setting the bars on edges in parallel after the threads have been wound round the bars for the whole design, pasting a lining on the top surface of the bars around which the threads are wound, and cutting the threads around the bars along the center lines on the opposite surface of the bars; and it has for its object to obtain a process of manufacturing pile fabric, such as carpet, of any desired shapes and with a wide breadth and short roots of piles in an easy and efficient manner by using any reduced original designs and slender bars.

The accompanying drawings show an apparatus according to this invention Fig. 1 is a front view of the apparatus, Fig. 2 a plan view of the same, Fig. 3 a front view of a friction clutch, Fig. 4 a plan view of the same, Fig. 5 a longitudinal section showing a mechanism for rotating bars round which threads are wound, Fig. 6 a cross section of the same, Fig. 7 a longitudinal section of a mechanism for moving a rack, Fig. 8 a front view of an apparatus for feeding and rotating a cylinder, Fig. 9 a plan view of the same, Fig. 10 a cross section of the apparatus on the line A—A in Fig. 2. Fig. 11 an end view showing a clutch and transmission mechanism for the bars and cylinder, Fig. 12 a plan view of the same, Fig. 13 a perspective view of the bars around which threads are wound Fig. 14 a cross section of the same, Fig. 15 a plan view showing how the bars are set on edges in parallel and put in a frame, Fig. 16 a longitudinal section of the same, and Fig. 17 a sectional view showing how the bars on the top surface of which a lining is pasted, are raised from ends while the threads are cut on the opposite surface. In the drawings the same reference numerals show the same parts.

The features of the invention will be understood from the following description referring to the drawings.

Holder tubes **10**, **11**, **16** are arranged in a straight line with suitable spaces between them, the tubes **10** and **11** being mounted on bearings **55** rotatably and the tube **16** being supported by a support **57**.

The tubes **10**, **11** are connected to a shaft **17** through toothed wheels **7'**, **8'**, **9'** and **7**, **8**, **9** respectively and thence to a motor. In the holder tube **10** are inserted two slender bars **13** joined together, on which threads are wound round, the left ends of the bars being inserted in the tube **11**. On the end of the tube **10** is screwed a cap **12** having a rectangular hole through which the bars **13** pass, thereby enabling the latter to rotate together with the tubes **10**, **11**. In the tube **16** is inserted a rack **14** which is connected with the shaft **17** through toothed wheels **21**, **25**, **20** and a pinion on which a clutch is provided. On the end of the rack **14** a cap **15** is mounted rotatably and this portion is inserted in the tube **10** so that the rack moves forwards in a straight line without friction with the tube **10**.

The right ends of the bars **13** are held by the cap **15** and the bars are pushed thereby to the left, thus enabling the threads to be wound in order round the bars between the tubes **10** and **11**. At the right end of the rack **14** a weight **24** is hung so that the rack returns to its original position as soon as the clutch is disengaged.

32 is a cylinder on the periphery of which the original design is stuck. The cylinder is mounted slidably on a shaft **30** provided with a groove **31** for a wedge. The forked ends of a handle **34** secured on a screw rod **35** are fitted in a circular groove **33** provided along the periphery of an end portion of the cylinder. The cylinder is rotated through the shaft **30** and the mechanism mentioned below and can be also moved to the left by the handle **34**.

At the right end of the shaft **30** are provided a clutch **29** and a worm wheel **28** engaging a worm **27** provided at the rear end of the shaft **26**, and at the left end are provided a clutch **40** and a toothed wheel **39** connected with a screw rod **35** through toothed wheels **38**, **37**, **36**, and also a weight **41** is hung.

The clutches **29** and **40** have teeth cut oppositely to each other, and the motive power is transmitted to the worm wheel **28** through the shaft **26** of the toothed wheel **25**, and thus the shaft **30** is rotated. While the cylinder **32** is rotated, the clutch **40** races, and when the clutch

29 is disengaged and the shaft 30 is rotated reversely by the action of the weight 41, the cylinder makes also reverse rotation, a claw 56 engaging a stop 59, and thus the cylinder returns to its original position.

At the same time the clutch 40 operates also to rotate the screw rod 35 through the wheels 39, 38, 37, 36, when the cylinder is moved to the left by one file by the handle 34 and hence the position of the original design on the cylinder changes in conjunction with the indicator.

A motor 1 is connected with the shaft 17 through a belt 2, friction clutch 3, 4 and wheels 5, 6. The friction clutch is connected with a pedal 50 through levers 48, 49. By pedalling the pedal 50 the power is transmitted to the shaft 17 through the friction clutch, and the tubes 10 and 11 and the bars 13 are rotated through the shaft 17, toothed wheels 7, 8, 9 and 7', 8', 9', and the rack 14 is also acted upon through the worm 18, worm wheel 19, toothed wheels 20, 25, 21 and pinion 22, thereby moving the rack 14 forwards and feeding the bars to the tube 11, and rotating the cylinder through the shaft 30, shaft 26 of the wheel 25, worm 27 and worm wheel 28.

Thus, the threads of different colors corresponding to the patterns and colors of the original design on the cylinder are wound by one file round the bars between the tubes 10 and 11 as indicated by the indicator 51 during the operations above described.

44, 45, 46 are links connected with a handle 47, which links are connected with the clutches 23 and 29 respectively through levers 43 and 42.

Each time the threads of different colors corresponding to the colors and patterns in the file of the original design have been wound round the bars, the handle 47 is operated to disengage from the clutches 23 and 29, when the cylinder and rack return simultaneously to their original positions by the action of the weights 24, 41, and the cylinder is moved each time by one file by the handle 34. The bars are replaced with others through the left end of the tube 11.

To work the above apparatus, the portion of the bars near the left end is brought, in the first place, between the tubes 10, 11 and the cylinder is brought to a suitable position at the right portion of its shaft so that the first file on the left of the original design is indicated by the indicator 51.

Power is then transmitted to the shafts 17, 30 to rotate the bars and cylinder. The bars are rotated at such a high speed as about 1500 rotations per minute while they are moved forwards from the tube 10 so that the threads 52 are wound round the bars. The same operations are repeated for the second file and so on.

After the threads have been wound round the bars for the whole design, the bars are set on edges in parallel as shown in Figs. 15 and 16 so that the threads present the reverse design, and then placed in a frame 53 and tightened by inserting filling 60.

A lining 54 is pasted on the threads and it is subjected to drying. Then the upper portions of the frame are removed as shown in Fig. 17, and the threads on the opposite surface are cut by inserting a knife between two bars while the fabric is taken away. In this manner carpets of pile fabric with the same design as the original can be manufactured.

According to this invention, it is also possible to manufacture two sheets of carpet simultaneously by winding threads round each bar and setting up the bars in parallel in order, and pasting linings on the upper and lower surfaces of the threads around the bars, and cutting the threads along the middle lines.

The special effects produced by this invention are as follows:

1. It is possible to give each carpet any different design in a simple manner, in other words, the invention has advantages of both hand weaving and machine weaving;

2. It is possible to manufacture easily carpets of any shapes, such as square, round, triangular, hexagonal, etc.;

3. The bars are inserted in the holder tube so that they rotate together, and therefore the bars will not bend or be twisted, and it is possible also to manufacture carpets with a wide breadth and short roots of piles rapidly in a simple manner;

4. Reduced original designs may be used to manufacture carpets of large size;

5. The bars are inserted in the holder tube, and so noise is prevented during the rotation, and moreover workers may remain in the same seats during the operations. Consequently they can work longer without excess labor, and hence efficiency is increased.

GENKICHI NIKI.

PUBLISHED

JUNE 22, 1943.

BY A. P. C.

G. NIKI

PROCESS FOR MANUFACTURING PILE FABRIC SUCH AS CARPET

Filed Feb. 21, 1940

Serial No. 320,175

7 Sheets-Sheet 1

Fig. 1

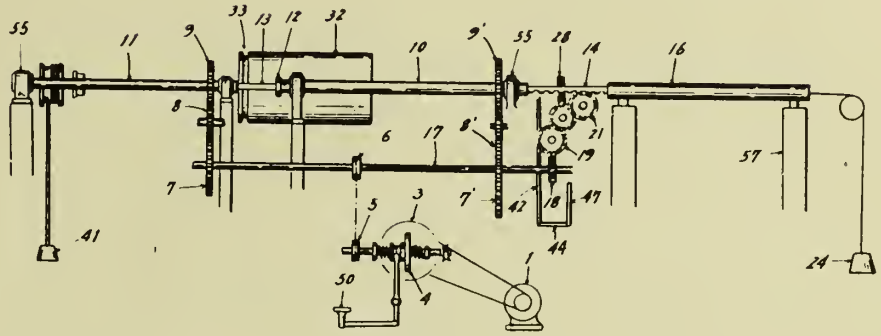
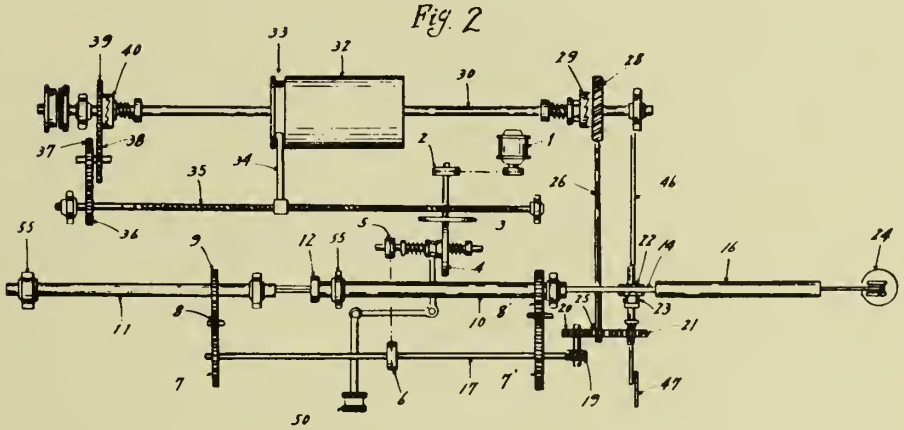


Fig. 2



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PROCESS FOR MANUFACTURING PILE FABRIC SUCH AS CARPET
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Serial No.
320,175
7 Sheets-Sheet 2

Fig. 3

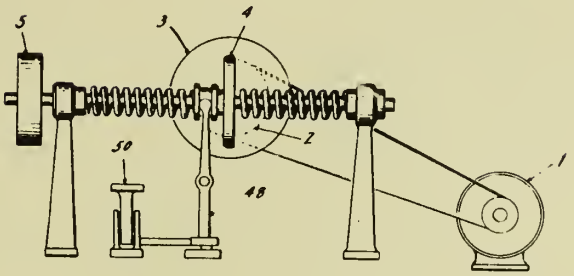
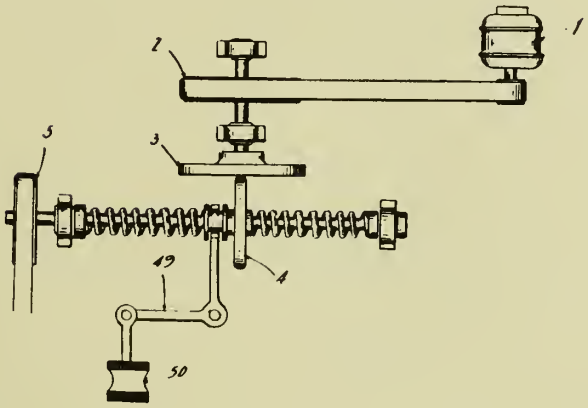


Fig. 4



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PROCESS FOR MANUFACTURING PILE FABRIC SUCH AS CARPET
Filed Feb. 21, 1940

Serial No.
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7 Sheets-Sheet 3

Fig. 7

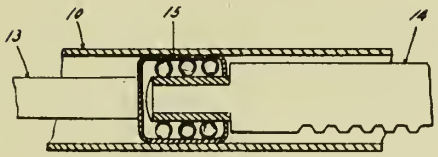

Fig. 6

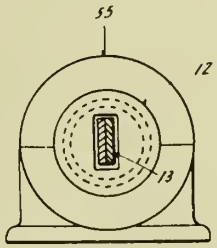

Fig. 5

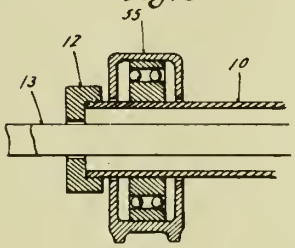

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Fig. 8

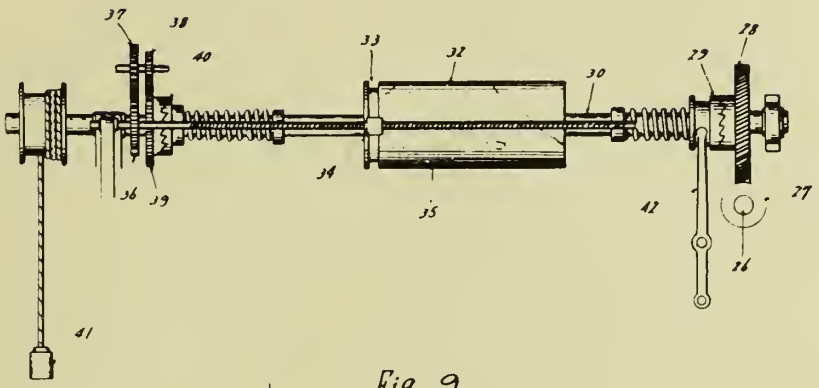

Fig. 9

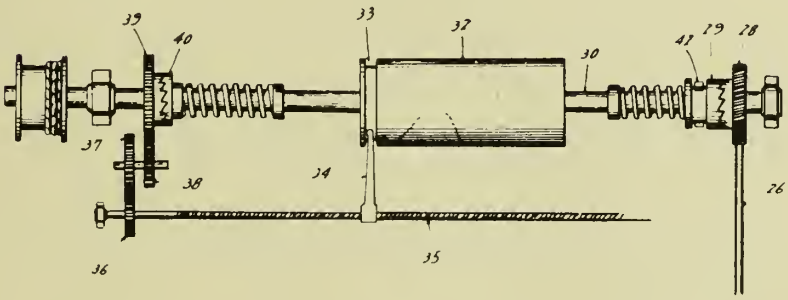

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Fig. 10

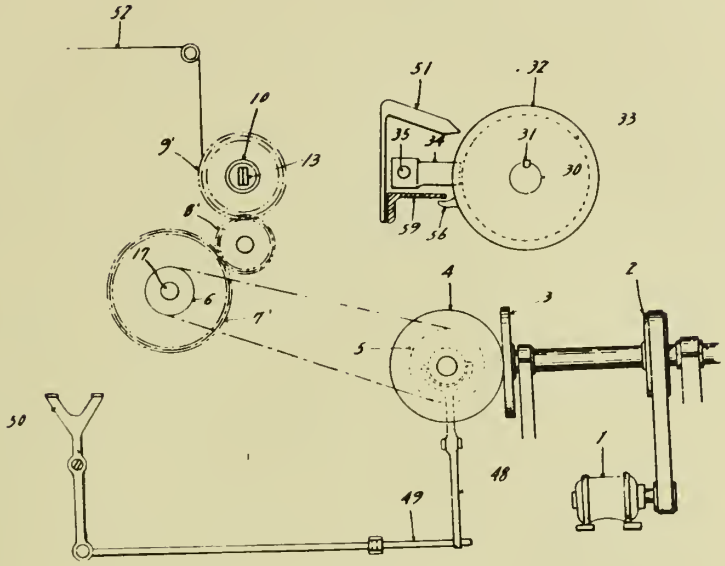

Fig. 17

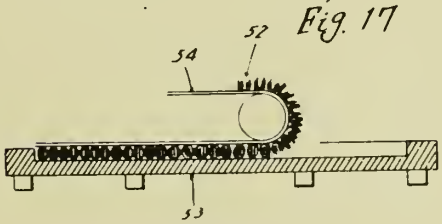

Fig. 13

Fig. 14

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Fig. 11

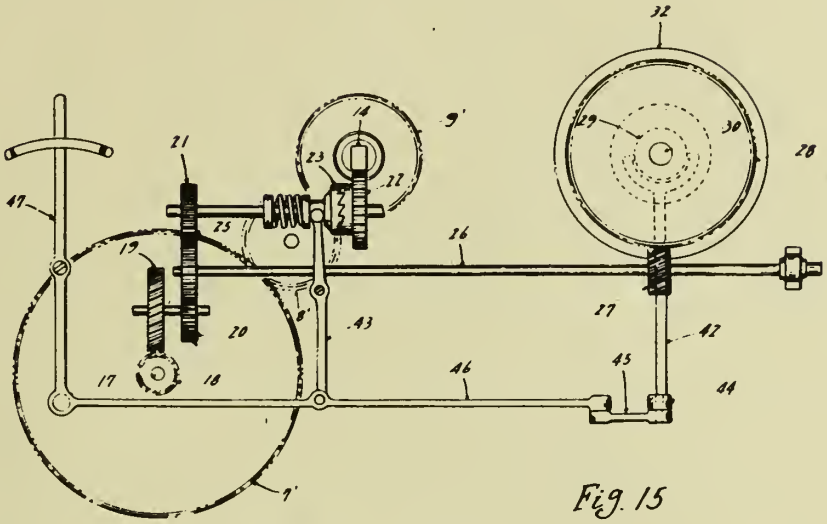

Fig. 15

Fig. 16

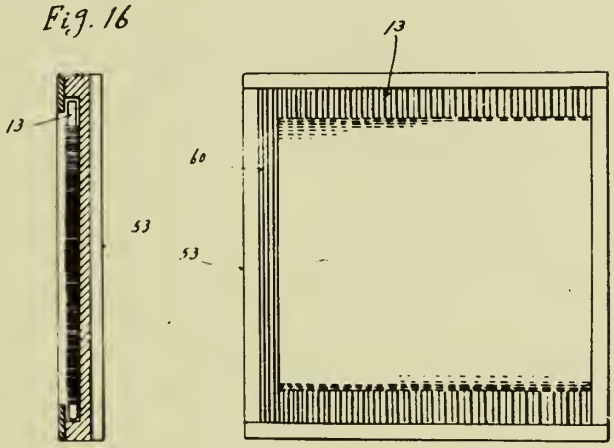

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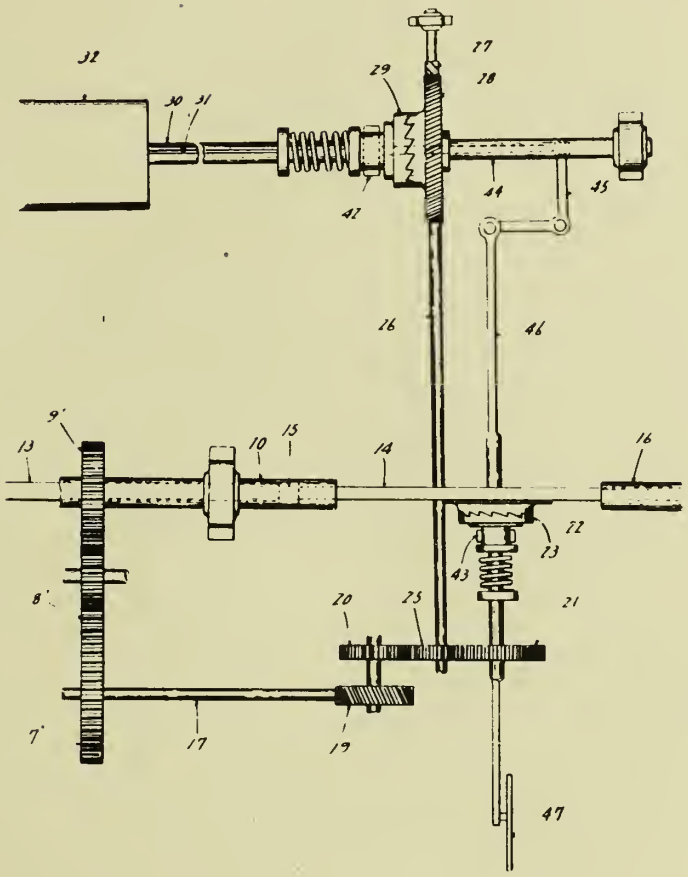
Fig. 12



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ALIEN PROPERTY CUSTODIAN

DEVICE FOR FUNCTIONAL TEST OF ORGANS OF LIVING BODIES

László Rósa and Imre Zakariás, Budapest, Hungary; vested in the Alien Property Custodian

Application filed May 3, 1940

The present invention relates to devices for functional test of organs of living bodies (f. i. heart, lungs, veins, muscles etc.) for converting the variations of the resonant frequency and/or damping of a tuned circuit due to the action of the organ to be tested and placed nearby to said tuned circuit into energy having an amplitude proportionately to said frequency and/or said damping variations.

Object of the invention is a device for functional test of organs comprising substantially beside said tuned circuit an electron discharge tube having at least two control electrodes or grids for controlling the space current passing from the cathode to the anode of the tube and one or two generators for alternating potentials preferably of high frequency. Impressing alternating potentials of the same frequency and in nearly quadrature phase relation on said control electrodes, there is produced by mutual intermodulation of the potentials on the electrodes in the anode current of said tube a component having an amplitude varying proportionately to the relative frequency departure of the potentials on the electrodes, which amplitude variations can be observed, recorded, i. e. used for functional test.

Said tube may be preferably of pentagrid-converter or triode-hexode type, in order to avoid the use of a particular oscillator tube. An alternating potential impressed on the first grid near the cathode of said tubes will cause a potential at the frequency of the impressed potential to be induced on the second control grid by unilateral space charge coupling, which is utilized in the case of the pentagrid-converter type. Using a triode-hexode type the space charge coupling is substantially eliminated by means of a condenser connecting the grids. In certain cases, especially very high frequencies, a resistance is advantageously placed in series with the coupling condenser in order to equalize the effect of the transit time of the electrons passing from one grid to the other. If the space charge coupling is neutralized in this manner a new unilateral coupling is produced between the grids in a direction from the second grid towards the first grid.

Figure 1 is a diagram of a circuit adapted for an embodiment of the invention.

Figure 2 is a characteristic curve explanatory of the function of the above circuit.

Figure 3 shows the arrangement for a heart action test.

Referring to Figure 1, item 1 represents a triode-hexode; the cathode 2; the triode grid 3 and the triode anode 4 are connected in the known Hartley circuit to the tuned circuit comprising the inductance coil 5 and the preferebly variable condenser 6 for exciting oscillations. The condenser 7 and the resistance 8 are known coupling elements in the grid circuit, the resistance 9 and the by-pass condenser 10 in the anode circuit, and the resistance 11 and the by-pass condenser 12 in the cathode circuit. Item 13 represents the screen grid of the hexode. The second control grid 14 of the hexode is connected to the grid 3 of the triode within the tube. The space charge coupling directed from the first grid 15 towards the second grid 14 is eliminated by the condenser 24 and resistance 25. By means of the unilateral capacitive coupling directed from the second grid 14 towards the first grid 15 the tuned circuit comprising the inductance coil 17 and the condensers 16 and 18 is excited by the oscillations generated in the tuned circuit 5—6. Nearby to or between the electrodes of the condenser 16 the organ to be tested is to be placed.

In Figure 2 the anode current I_a is plotted as a function of the oscillator frequency f_o. f_{g1} represents the natural frequency of the tuned circuit 16—17—18. The working point of the tube (advantageously on the middle, steep portion of the curve) can be tuned in by means of the variable condenser 6 in observing the milliamperemeter 26. The potential variations on the working resistance 19 in the anode 19 circuit feed the amplifier and the recording device 20. The resistance 21 and the by-pass condensers 22 remove the components of high frequency from the anode circuit of the hexode.

In Figure 3, the device 27 contains the coupling elements of Figure 1; the amplifier and the recording apparatus 20 together with the voltage sources will be arranged preferably in a particular container. The one electrode of the condenser 16 is placed above the place of the heart of the patient 28, the action of which is to be tested. The other electrode serves for balance with respect to unwanted influences from without.

Object of the invention is also the balanced arrangement of the electrodes of the condenser 16 referring to "earth." It is also often advantageous to screen the inactive parts of the electrodes and the leads.

Instead of capacitive detuning of the tuned circuit 16—17—18 by means of the condenser 16, inductive detuning by means of the coil 17 ar-

ranged nearby to the organ to be tested can also be applied, or both kinds of detuning can be used at the same time. The damping of said tuned circuit will be varied to some extent in all cases.

Another object of the invention is supplying the feeding voltages for the tube **1** from the mains, the use of at least two consecutive stages of voltage stabilization to remove the fluctuations of the mains voltage from the anode of said tube, whereby at least in one stage, stabilizer tube (tube filled with inert gas) is used, and the other stages can be represented also by stabilizing transformer, motor-generator or special tube circuit. Such a special tube circuit can be provided by adjusting the amplification of the tube **1** in order to balance the fluctuations of the supply voltages of the anode **23** and of the screen grid **13** respectively against another relative to the anode **23**.

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Fig. 1.

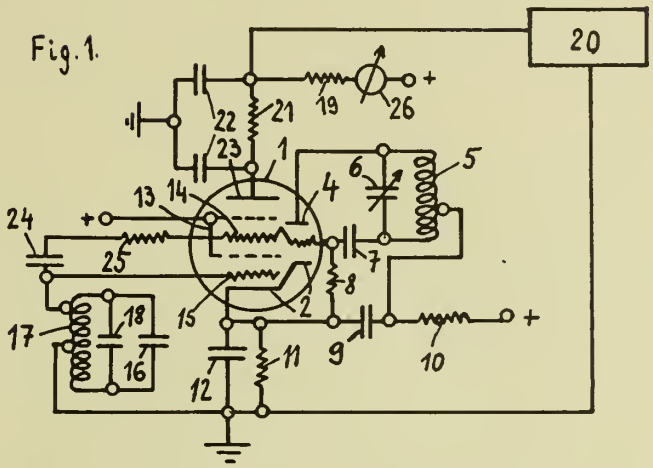


Fig. 2.

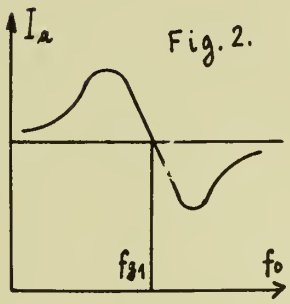
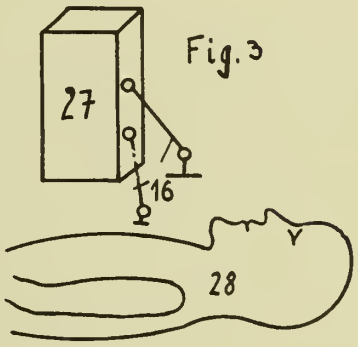


Fig. 3



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ALIEN PROPERTY CUSTODIAN

TUBULAR BODY OF INSULATING MATERIAL

Hans Thommen, Baden, Switzerland; vested in the Alien Property Custodian

Application filed May 14, 1940

For switching electrical circuits, circuit breakers employing compressed air for extinguishing the arc and for actuating the circuit breaker are now used. In such cases the compressed air is conveyed through insulating tubes and also by means of the supporting insulators of the circuit breakers themselves. For the pneumatic operation of gas blast circuit breakers the supporting insulator of the circuit breaker is used as a reservoir for the compressed air and is provided with grooves in its internal surface. These grooves enlarge the surface creeping distance but have the disadvantage of also increasing the flow resistance.

The present invention thus concerns a tubular body of insulating material through which a medium under pressure flows at least intermittently and which is provided with grooves on its internal surface. According to the invention these grooves which are located perpendicular to the direction of flow are so arranged and dimensioned that they enlarge the surface creeping distance without increasing the flow resistance.

The invention will now be described by way of example with reference to the accompanying drawing in which the figure shows a diagrammatic view of a compressed air pipe in longitudinal section.

The pipe *a* which is made of insulating material, either a ceramic material or a compressed mass, is provided on the inside surface with grooves *b* which form a continuous undulation. The pitch *c* of the grooves is selected to be less than $\frac{1}{5}$ to $\frac{1}{3}$ of the diameter *d* of the free section of flow of the pipe. By this means the surface creeping distance in the pipe is increased without increasing the flow resistance. The compressed air pipe *a* can be inserted in a metal tube to serve as a lining; it can also be used without a protective tube and be provided also with grooves or insulating ribs on its external surface. The grooves inside the compressed air pipe can also form a thread having a pitch in accordance with the aforementioned condition. The inside wall of the compressed air pipe can also be provided with pockets instead of grooves and these pockets can be given such a form that the compressed air can only flow through the pipe in one or in both directions.

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JUNE 22, 1943.
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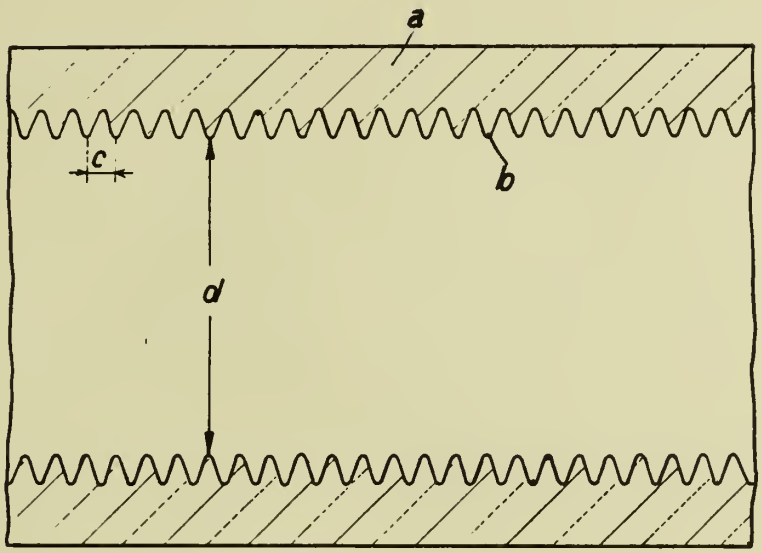
Serial No.
335,154



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ALIEN PROPERTY CUSTODIAN

CONCENTRATING DEVICE FOR CARTRIDGES AND METHOD OF CONSTRUCTION THEREOF

Wladimir de Garkovenko, Vallauris, France; vested in the Alien Property Custodian

Application filed May 18, 1940

The present invention relates to concentrating devices for the shot of shot-gun cartridges of the kind in which a casing for the shot is connected by a string to a pad or pads.

In such a device, which acts partly as a tracer cartridge and partly as a concentrator, the weight and volume have necessitated reducing the charge of shot and powder which considerably modifies the ballistic results. The rubber casing used varies with the temperature and weather which modify its physical properties so that the retarder made of elastic material cannot resist air pressure which causes great variation in the retarding action on which the efficiency depends whilst moreover no means are proposed for suitably regulating the device.

The present invention provides a novel concentrating device which permits of obtaining high speed cartridges giving very close dispersion of shot, the density of disperison being variable. In this way there is obtained a result which was hitherto unattainable.

The chief feature of the device resides in the combination with a fairly thick cylindrical wad of a fabric casing of light weight and volume containing the charge of shot, and to which the cylindrical wad is connected by a string so that it is caused to play the part of a retarding stabiliser which separates the casing from its contents at a pre-determined distance from the mouth of the barrel, the shot having up till then been kept closely assembled, thus giving a high speed cartridge with close dispersion of shot which dispersion can be varied as required.

Another feature resides in that the distance at which the separation of the casing and shot due to the wad, can be adjusted by varying the surface, the weight, and the density thereof so that it fills the role of regulating the discharge of the concentrating device.

These features will be brought out clearly from the following description with reference to the accompanying drawing, which shows:

Fig. 1 the concentrating device constructed according to the invention;

Fig. 2 the same in position in the cartridge;

Fig. 3 the supporting mandrel, with socket, used for the shaping of the casing;

Fig. 4 the shaping device in action;

Fig. 5 another phase in the shaping of the casing;

Fig. 6 the machine permitting the ramming of the charge of shot and the binding of the casing;

The concentrating device in conformity with the invention consists first of all of a casing 1 (Fig. 1) of thin, solid and resilient material which is preferably a bad conductor of heat, for example cotton fabric, adapted to contain the charge of shot for the cartridge.

This casing is in the form of a small cylindrical sack pierced with an opening 2 of circular or other shape at its end.

The neck of the sack is tied by a string 3 so as to enclose a washer 4 of light, strong material such as cardboard, which permits of connecting the casing, by means of a string 5 to a suitable wad 6 completing the concentrating device.

This latter is inserted in a cartridge in the manner shown at Fig. 2.

In this figure, the cartridge 7 has a charge of powder 8, the wad 6 and the casing 1 containing the charge of lead shot 9. A disc 10 of cardboard closes the cartridge in the ordinary manner.

The effect of the concentrating device is as follows:

At the moment of firing, the wad 6, connected to the casing 1, by the string 5, acts during its passage through the barrel of the gun like an ordinary wad. In leaving the mouth thereof it follows behind the casing 1 at a distance equal to the length of the string; it then begins to act as a stabiliser and a retarder.

At a certain distance from the mouth it forces the casing 1 to release the charge of shot forwardly and thus causes a lag in the dispersion of the latter.

The distance at which the shot leaves the casing 1 can be modified at will by taking into consideration not only the strength of the casing retaining the shot due to the tension of the casing itself and the diameter of the opening in the end of such casing, but also due to the surface, density and weight of the wad-retarder and consequently also on the speed and resistance with which the wad follows the casing.

It suffices therefore to increase the density of the wad and consequently its speed to retard the release of the shot from the casing and improve the density of dispersion.

By increasing the surface of the wad and by diminishing its density, the wad looses speed more rapidly and will tear off the casing a little sooner which will increase the dispersion of the shot.

The concentrating device is applicable to most kinds of fire-arms.

The softness of the casing 1 permits of using the concentrator even in choke-bore barrels.

Further the lightness of the casing and the small volume which it occupies in the cartridge

permits of using the normal charge and calibration sockets.

Finally, by reason of its light weight, the casing allows of the production of very high speed shot cartridges and to obtain a very close dispersion which was impossible hitherto.

Thus, for example, with a calibre of 12, a charge of powder T of 2 gr. 80 and a charge of shot of 30 grs. there is obtained an initial speed of 548 meters and a grouping of 88% at 36.50 m. from the mouth of the barrel and with shot No. 6 Paris and that at normal pressure.

The construction of the concentrating device is obtained in the following manner:

First cut out, from the material selected to form the casing 1 (cotton fabric) four discs of appropriate diameter.

At the centre of said discs, the fabric is coated by means of a rubber adhesive, varnish or other suitable material which gives homogenity to the threads and prevents them subsequently fraying when the opening 2 is formed therein.

Next each disc is folded along two perpendicular lines inclined at about 45 degrees to the warp and weft threads of the fabric.

The disc is then placed on the supporting mandrel 11 (Fig. 3) so as to form four wings of which the above mentioned folds form the edges.

In the mandrel 11 slides a plunger 12 the free end of which has as diameter that of the opening 2 to be formed in the casing 1. A screw 13 limits the stroke of the plunger and also prevents it leaving the mandrel.

The casing 1 is then pressed around the mandrel by a shaping tube 14 (Fig. 4) of thin metal having four claws 15 in such a manner that the wings of the casing engage between the latter.

The wings of the casing are flattened by winding the shaping tube in a spiral direction on the mandrel 11.

The shaper 14 is then removed and whilst holding the casing tightly in its wound up position, a ring 16 (Fig. 5) is slid over it, the internal diameter of said ring 16 varying according to the pressure to be applied to the fabric of the casing.

A guide tube 17 of which the internal diameter is equal to the calibre of the cartridge and in which has previously been introduced the cardboard closing disc 10 (Fig. 1), is then slid over the casing.

The guide tube 17 is pushed down until it contacts with the ring 16. The edge of the tube 17 is pressed against a suitable metal plate and the support 12 is pushed down with a hammer blow so that it cuts an opening 2 in the casing 1, without cutting the cardboard disc 10, this being obtained by suitable adjustment of the screw 13.

The ring 16 is then slid down to abut against screw 13 and the tube 17 is removed with the casing from the mandrel 11, whereafter the charge of shot is filled into the casing 1.

The tube 17, with the casing 1, is then brought beneath a packing machine 18 (Fig. 6) comprising a lever 19 operating a pinion wheel 20 engaging a rack 22 formed on a rod 21 which latter can thus be moved up and down.

The rod 21 has a central passage 23 which can be reached from the upper part of the mandrel through an opening 24.

On the rod 21 is secured a ring 26 by means of a screw 25.

Finally on the base of the machine is screwed or otherwise suitably secured, a metal stud 27.

Through the passage 23 in rod 21 is passed a string 5 which comes out at the bottom of the rod 1 to permit of fitting the cardboard disc 4 in position and holding it in place by a knot.

The tube 17 rests on the machine around the stud 27 on which the cardboard disc 10 rests.

The rod 21 being raised to its upper position, a second tube 17 is fitted above the former and likewise surrounds the casing 1. The rod 21 is lowered and after sliding the upper tube 17 upwardly thereon the casing is pulled taut above the disc 4 by means of a string 3 passed through the gap left between the two tubes 17.

The rod 21 is raised again and the lower tube 17 containing the casing 1 loaded with the charge of shot 9 as in Fig. 1, is removed from the machine. The string 5 having been cut to a suitable length, the free end is passed with a needle, through the wad 6 and knotted. This completes the concentrating device which is placed in position in the cartridge as shown in Fig. 2 and closed by any usual machine for this purpose.

It is obvious that modifications in details can be embodied in the device above described without thereby exceeding the scope of the invention defined in the appended claims.

For instance, stamped plugs could be fitted to the packing to vary, in suitable predetermined proportions, the density and weight of the latter.

Figs. 3 to 6 serve only to assist in understanding the manner of carrying the invention into effect and do not form part of the invention per se.

WLADIMIR DE GARKOVENKO.

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BY A. P. C.

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CONCENTRATING DEVICE FOR CARTRIDGES AND METHOD OF CONSTRUCTION THEREOF

Filed May 18, 1940

Serial No. 336,019

2 Sheets-Sheet 1

Fig. 1

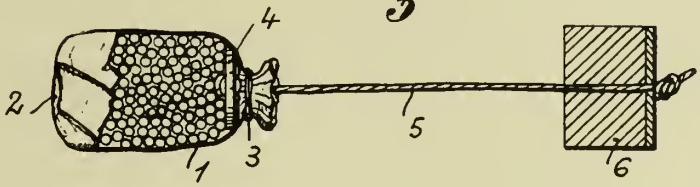


Fig. 2

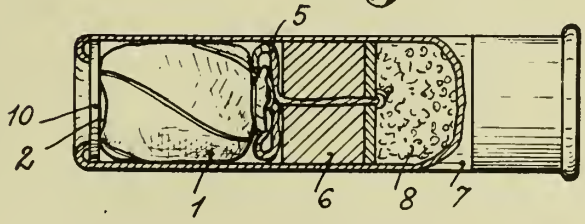


Fig. 3

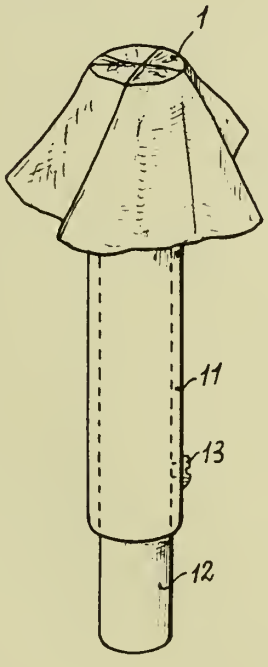
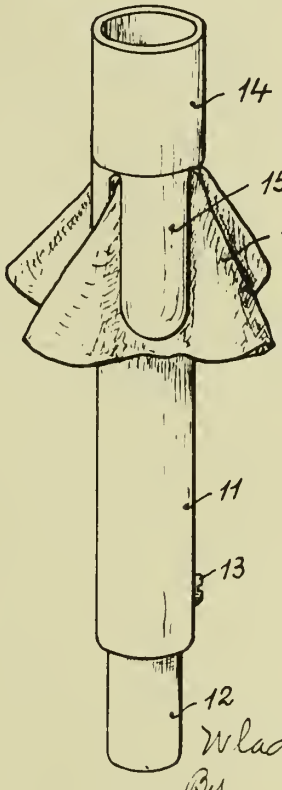


Fig. 4



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2 Sheets-Sheet 2

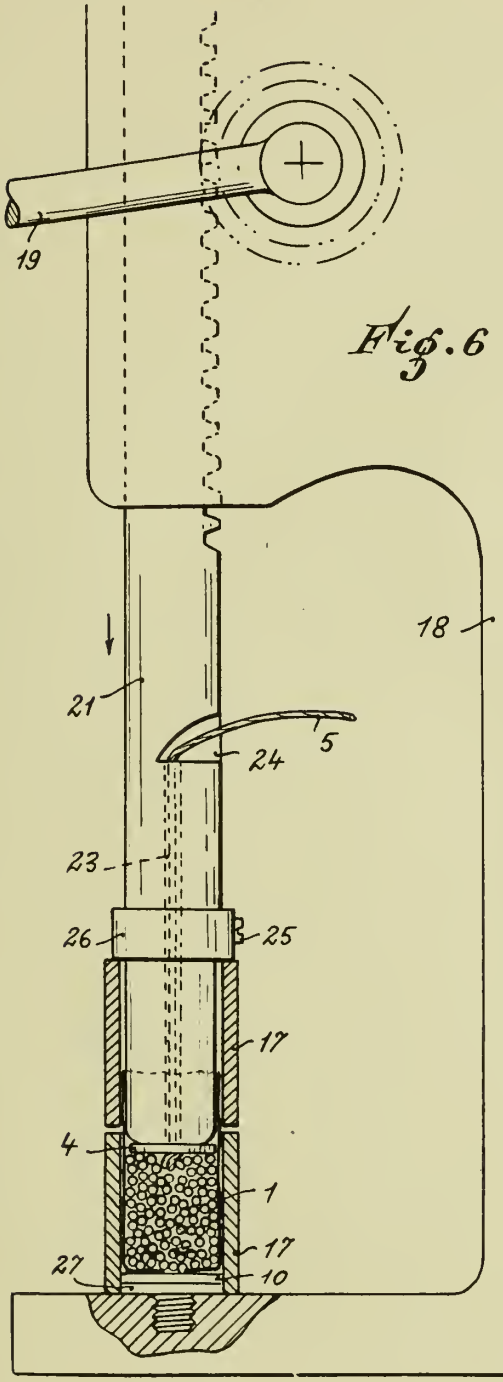

Fig. 6

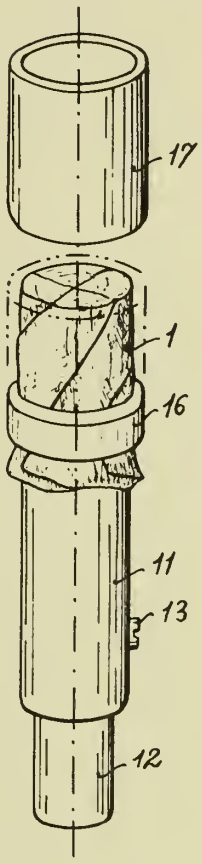

Fig. 5

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ALIEN PROPERTY CUSTODIAN

THERMOPHORES

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No Drawing. Application filed June 29, 1940

Known forms of rubber thermophores which when filled with hot water are used for warming up of human body, have the disadvantage that the water must be first tempered to the temperature which the patient can bear, because the heat penetrates very quickly through relatively thin rubber walls, and if this temperature is high, the heat may uncomfortably affect the skin of the patient under treatment. Further disadvantage comes from the fact that the water in the thermophore soon cools off to such a degree that it must be warmed up again. This is especially uncomfortable when using the thermophore at night, on travels or in such other occasions when there are no facilities for repeated warming up of water or when such heating of water results in extra expenses.

In order to attain a more uniform heating by means of such thermophore and to make its heat to last longer, it has been tried to wrap the thermophore in textile tissues or the like. The results were not satisfactory since the water cooled again rather quickly. The aim of this invention is to materially prolong the duration of each warming up period by means of such thermophore.

According to this invention the above disadvantages are overcome by providing in any desired or convenient manner cavities in the rubber walls of the thermophore whereby the transmission of heat therethrough from the inside of the thermophore to its outside is greatly reduced due to much slower rate of penetration of heat through the insulating air layer between the outer and inner walls. This insulating air layer can be obtained also by doubling the walls of the thermophore and one of these walls may be provided on its inner side with stay-off means such as beads, parallel or crossed ribs or a layer of spongy rubber, or this intermediate layer may consist of any other suitable filling or packing material such as glass or slag wool, packed between these double walls of the thermophore in any desired or suitable manner. When the glass or slag wool is used for this heat insulating intermediate layer the advantage of much longer conservation of heat is secured and the rate of giving off of heat from the thermophore becomes appreciably more uniform and longer lasting.

The thermophore walls may be made of several sheets of rubber between which the glass or slag wool is packed in any desired or suitable manner and the whole is then vulcanised or cemented together, assuring thereby even more uniform heat transmission. Similarly, the walls of the thermophore may consist of glass or slag wool mixed in the rubber.

These intermediate layers of glass or slag wool may be made of dressed or undressed glass or slag wool, and in case of dressed wool the fibers of various lengths may be arranged in parallel or crossed arrangement or may be woven to form gauze like material.

When a thermophore with walls made in accordance with this invention is filled with hot water which may be boiling hot, the heat penetrates only very slowly through the air layer or through the intermediate layers of glass or slag wool interposed between the rubber walls of the thermophore, and thus cannot harm the skin of the user, and, what is very important, this heat transmission is maintained for five to ten times longer periods than it is possible with the ordinary thermophores, this feature being a considerable improvement over the known types as regards the efficiency of the thermophore.

SAMUEL I. DAVITCHO.

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ALIEN PROPERTY CUSTODIAN

PROCESS OF MANUFACTURING CYCLOPENTENONEDERIVATIVES

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No Drawing. Application filed August 20, 1940

The processes having become known up to now for the manufacture of cyclopentenonederivatives can be divided into two groups. In the one thereof the process starts from a finished cyclopentene-nucleus or cyclopentane-nucleus respectively. There is thus, obtained for instance, alkylcyclopentenones from the nitrosochlorides of the alkylcyclopentenes when these are treated with potassium acetate and acetic acid. This process is, however, not generally applicable, as the use of dialkylcyclopentenes in which the double bond lies between the substituted nucleus-carbon atoms is not possible. The process presupposes, furthermore, the indifference of the selected alkyl groups with respect to nitrosylchloride and the like. Besides, the yield is in most cases not satisfying.

The other of the above mentioned two groups starts from linear compounds. There is, thus, obtained, for instance, methyl-alkyl-cyclopentenones if esters from laevulic acid and esters from α-halogenfatty-acids are used as starting materials (compare, for instance, Helv. Chim. Act. VII, pages 256/257, 1924). Also this process is subjected to similar restrictions as that for the manufacture of alkylcyclopentenones from alkylcyclopentenes. A particularly grave drawback connected therewith in this case is the comparatively slight yield. Thus, Staudinger and Ruzicka have obtained only about 1½ grams of methyl-amyl-cyclopentenone from 318 grams of ethyl-α-bromenanthate and 182 grams of ethyl-laevulinate (see also Treff and Werner, Berichte 68, pages 642/643, 1935).

Also the reaction found by Blaise, according to which ethyl-methyl-cyclopentenone can be obtained from dipropionyl-ethane shall be mentioned.

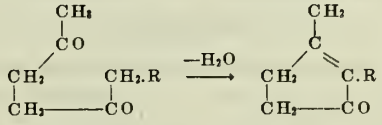
The ring closure of the acetonyl-acetone instead of the dipropionyl-ethane is not possible. In this case dimethylfurane or resinous products are obtained but by no means the desired methyl-cyclopentenone. This behaviour has been taken over, as is known, into the text-book literature as a classical example for the reaction of the aliphatic γ-dicetones. It seems, therefore, that the presence of methyl-groups in a position adjacent to the CO-groups excludes the formation of a cyclopentenone nucleus.

I have discovered that, in a surprising contrast to the hitherto usual opinion, the γ-dicetones are able to form a cyclopentenone nucleus if a methyl-group is in a position adjacent to one of the two CO-groups but a methylene-group in a position adjacent to the other of the CO-groups, that is to say, if the γ-dicetones correspond to the formula

$$CH_3.CO.C(R_1R_2).C(R_3R_4).CO.CH_2.R_5$$

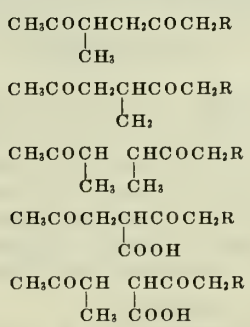
In this formula R_1 R_2 R_3 R_4 denote hydrogen or any other desired univalent group, f. i. methyl, carboxyl or the like. R_5 is an univalent aliphatic or aromatic or a substituted group.

The ring closure itself is a very simple operation. In many cases one obtains a practically quantitative yield, if the procedure is carried out in the presence of alkaline or—with poor yields—acid condensation-agents. The ring closure takes place according to the following formula:



Thus, cyclopentenonederivates are obtained when the following compounds are used as starting materials:

$CH_3.CO.CH_2.CH_2.CO.CH_2.C_4H_9$ (C_4H_9=butyl)
$CH_3.CO.CH_2.CH_2.CO.CH_2.C_5H_9$ (C_5H_9=pentenyl)
$CH_3.CO.CH_2.CH_2.CO.CH_2.CH_2.COOH$
$CH_3.CO.CH_2.CH_2.CO.CH_2.CH_2.COOR$
(R=methyl, ethyl etc.)
$CH_3.CO.CH_2.CH_2.CO.CH_2.CH_2.CH_2.CH_2OH$
$CH_3.CO.CH_2.CH_2.CO.CH_2.CH_2.CH_2.CH_2OR$
(R=methyl, ethyl etc.)
$CH_3.CO.CH_2CH_2.CO.CH_2.CH_2.CH_2.CH_2Br$ (Cl, J)



etc.

Concerning the condensation agents it is most suitable to the object in view to make use of an aqueous, alcoholic or methyl-alcoholic potassium hydroxide solution, sodium-hydroxide or barium hydroxide solution, furthermore of a solution of alkali-alcoholates, alkaline earth hydroxides, alkali-carbonate or alkali-bicarbonate or of a solution of a similar substance, but it is as well possible to employ occasionally aqueous or non-

aqueous acids or solutions of acids, salts or the like. Finally, it is possible to carry out the reaction in the gas-phase, the vapor of the dicetone being then subjected to the action of heat, may be with the simultaneous use of dehydrating agents.

The process constituting the present invention is more fully described in detail in the following examples:

First example

5.9 grams of 2,5-nonane-dione (b. $p._{15}$=112–114°) are heated to boiling temperature together with 76 grams of 2%-aqueous sodium hydroxide solution, the mixture being kept at that temperature for several hours. There are obtained 4.15 grams of 3-methyl-2-propylcyclopentene-2-one-1, which are 80% of the theoretical yield.

b. $p._{11,5}$=94,5°
Semicarbazone: m. p. 212°

Second example

4,4 grams of 2,5-decandione (b. $p._{17}$=132–134°) are heated with 52 grams of 3%-aqueous potassium hydroxide solution to boiling, the mixture being maintained boiling for some time. The oily layer is taken up by means of ethyl ether and is distilled in vacuo after the ether has been evaporated. There are obtained 2,9 grams, viz. 74% of the theoretical yield, of 3-methyl-2-butylcyclopentene-2-one-1 which is a liquid with an agreeable smell.

b. $p._{12}$=107°
Semicarbazone: m. p.=193–193.5°

Third example

In a similar manner as in the first and in the second example there are obtained from 9,2 grams undecandione (b. $p._{14}$=141°, m. p.=33°) 7,6 grams, viz. 92% of the theoretical yield of 3-methyl-2-n-amylcyclopentene-2-one-1. This product is dihydrojasmone, as appears from its analysis and its physical constants.

f.: H=10.96	C=79.28
calc.: H=10.92	C=79.45

The boiling point of the ketone purified by the semicarbazone is 120–121.5° at 12 mm. The semicarbazone did not show any fusing point depression together with a dihydrojasmonesemicarbazone manufactured according to Duden and Freitag.

Fourth example

If 6 grams of 2-methyldecandione-6,9 (b. $p._{13}$=128–132°) are heated together with 65 grams of a 2% aqueous sodium solution to boiling temperature for 24 hours, there are finally obtained, after the process has been finished, 4,4 grams, viz. 82% of the theoretical yield, of 3-methyl-2-i-amylcyclopentene-2-one-1, which is a liquid having an odour resembling that of jasmine.

b. $p._{12}$=114,5–118,5°
Semicarbazone: m. p.=181–182°

With higher molecular γ-dicetones it is recommendable to make use of somewhat stronger condensation agents, viz. an addition of alcohol, more concentrated solutions, solid alkali- or earthalkali-hydroxides, and the like. But the use of such stronger condensation agents is not a condition, as the success is the same by heating for a longer period with dilute solutions.

Fifth example

2,2 grams of 2,5-dodecandione (b. $p._{12}$=148°, m. p.=39,5–40,5°, semicarbazone: m. p.=187°) are stirred with 11 grams of hot 3%-potassium hydroxide solution for several days. After cooling and extracting with ethyl-ether there are obtained 1,6 grams, viz. 80% of the theoretical yield, of 3-methyl-2-hexylcyclopentene-2-one-1.

b. $p._{18}$=142–144°
Semicarbazone: m. p.=163,5–164,5°

Sixth example

A mixture of 3,6 grams of 2.5-tetradecandione (m. p.=50–51°), 20 ccm. of a 10%-potassium hydroxide solution and 30 ccm. of alcohol is heated to boiling and maintained at this temperature for 2 hours, whereafter the alcohol is distilled-off and the oily layer is taken up by ethyl-ether. Yield: 2,7 grams of 3-methyl-2-octylcyclopentene-2-one-1, which are 81,4% of the theoretical yield.

Liquid of flowery odour; b. $p._{12}$=157–160°
Semicarbazone: m. p.=159–159,5°

Seventh example

A solution of 4,9 grams of 2,5-octadecandione (m. p.=70,5°) in 30 ccm. of alcohol is heated to boiling together with 20 ccm. of a 50%-aqueous potassium hydroxide solution, this temperature being maintained for 1 hour. There are obtained 3,1 grams of 3-methyl-2-dodecylcyclopentene-2-one-1, which are 68% of the theoretical yield.

m. p.=34–35,5°
b. $p._{2,5}$=171–173°
Semicarbazone: m. p.=151,5–152,5°

Eighth example

When 11-methoxy-2,5-undecandione is heated with a mixture of 40 ccm. of a 5%-aqueous sodium hydroxide solution and 10 ccm. of alcohol 3-methyl-2 - (ε-methoxyamyl) - cyclopentene-2-one-1 is obtained.

b. $p._{14}$=146–148°
Semicarbazone: m. p.=150–150,5°

Ninth example

11,5 grams of 7-methyl-4,7-diketoheptoic acid (m. p.=76–78°) are dissolved in 200 ccm. of 4%-potassium hydroxide solution, the mixture being then heated to boiling for 2 hours. The originally colorless solution becomes somewhat darker. The mixture is cooled and neutralised with an amount of sulphuric acid accurately equivalent to the amount of the potassium hydroxide solution. Then the aqueous solution is concentrated by evaporation and the residue is extracted with ethyl-acetate. After the ethyl-acetate has evaporated there are obtained 10 grams instead of, theoretically, 10,3 grams of 3-methyl - cyclopentene - 2 - one-1-acetic-acid-2. After the recrystallisation of this product from ethyl acetate this acid forms stout crystals of m. p.=108,5–110,5°

Semicarbazone: m. p.=213,5–216° (decomposition)

Tenth example

From 11-methyl - 4,7-diketoundecanoic acid methylester (b. p.=163–165°, m. p.=31–32°) is obtained the methyl ester of the 3-methyl-cyclopentene-2-one-1-(-5-caproic acid)-2, a liquid of b. $p._1$=136–142°. The condensation agent to be used in this case is preferably a solution of

sodium methylate in dry methyl-alcohol. After the saponification the free acid of b. $p._2$=182–184° is obtained.

m. p.=63–65°
Equivalent weight=212 instead of 210.

Eleventh example

The condensation product of sodium salt of propionyl-acetic-acid-ester and bromoacetone is heated for some time together with an excess of 2%-sodium solution. The ester forms the correspondend γ-dicetone and this reacts by ring closure similarly to that described in the preceding example. There is obtained 2,3-dimethyl-cyclopentene-2-one-1.

Liquid of b. $p._{16}$=75–78°
Semicarbazone: m. p.=247,5° (decomposition).

Twelfth example

25 grams of α-capronyl-laevulic acid-ethyl-ester are gradually heated with 1 liter of 2% sodium hydroxide solution to boiling, neutralised after a short period of boiling and then extracted with ethyl-ether. There are obtained 10,7 grams, equal to 73,3% of the theoretical yield, of 3-methyl-2-butylcyclopentene-2-one-1 of

b. $p._{10}$=102–107°
Semicarbazone: m. p.=192°

Thirteenth example

In correspondence with the description concerning the preceding example 42,5 grams of α-heptene-(4)-oyl - laevulic acid-ethyl-ester are heated together with a 2%-sodium hydroxide solution to boiling. A sufficient quantity of acid is added and the product extracted with ethyl-ether. There are obtained 17,6 grams=65% of the theoretical yield of 3-methyl-2-(penten-2-yl) - cyclopentene-2-one - 1. b. $p._9$=122°. The product is identical with the natural Jasmone.

In a similar manner it has been possible to obtain the corresponding hexylcyclopentenonederivates from the α-enanthoyl- and the α-caprylyl-laevulic acid ethyl-ester.

Fourteenth example

25 grams of α-capronyl-β-methyl-laevulic acid-ethyl-ester have been treated in the manner described in the twelfth example. There has been obtained the 3,4-dimethyl-2-butylcyclopentene-2-one-1. Liquid of b. $p._{14}$=114–115°. Semicarbazone: m. p.=230–232° (decomposition).

There have, furthermore, been obtained from α-capronyl-α-methyl-laevulic acid-ethyl-ester the 3,5 dimethyl-2-butylcyclopentene - 2-one-1. Liquid of b. $p._{11}$=104°.

Fifteenth example

9,2 grams of 2,5-undecandione are dissolved in a 2%-methyl-alcoholic sodium hydroxide solution and heated to 60° for some time. The dehydration is then finished and the liquid has a dark color. After the methanole has been distilled-off the residue is acidulated and extracted with ethyl ether. One obtains a yield of 87% of dihydrojasmone with the constants stated in the third example.

Sixteenth example

2,5-undecandione is slowly distilled over silicagel containing a little alkalihydroxide and alkalisilicate and heated to a temperature little above the boiling point of the undecandione. The silicagel assumes a dark color during this time. The distillate contains dihydrojasmone and a small quantity of unchanged undecandione.

Instead of the katalysator just described there may be used other dehydrating katalysators, f. i. aluminium-silicate, titaniumdioxyde and the like.

Seventeenth example

A mixture of 50 grams of cold saturated potassium-carbonate solution, 30 ccm of alcohol and 4 grams of 2,5-dodecandione is heated under shaking in a sealed tube for at least one day to 120 to 140°. After settling of the process there are obtained about 80%, of the theoretical yield of 3-methyl-2-hexylcyclopentene-2-one-1.

Eighteenth example

4 grams of dodecandione are dissolved in 50 ccm of $\frac{1}{10}$ n methyl-alcoholic barium hydroxide solution and are kept boiling for 2 or 3 hours. There is obtained a yield of 64% of 3-methyl-2-hexyl-cyclopentene-2-one-1.

b. $p._{15}$=135–137°.

Nineteenth example

2 grams of sodium metal are dissolved in 40 grams of anhydrous methanol, whereafter 17 grams of acetic ester and 4 grams of dodecandione are added. The acetic ester is partially saponified by the water split off during the reaction. In this case sodium methylate is the condensation agent. There are obtained 2,8 grams, viz. 77% of the theoretical yield, of 3-methyl-2-hexylcyclopentene-2-one-1.

The products obtained by the present improved process are intended for use as perfumes, means for annihilating plant lice and other noxious animals etc. for the synthesis of curatives etc. and the like.

HEINZ HUNSDIECKER.

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ALIEN PROPERTY CUSTODIAN

PRODUCTION OF LINEAR POLYAMIDES

Paul Schlack, Berlin-Treptow, Germany; vested in the Alien Property Custodian

Application filed December 14, 1940

The present invention relates to the production of linear polyamides and more specifically to a discontinuous two-phase polymerization of amide-forming reactants.

It has been proposed to convert the reaction mixture in the production of polyamides by heat condensation of polyamide-forming reactants into homogeneous liquids before the conversion temperature is reached by adding such materials which dissolve the reaction mixture, such as phenols, alcohols or water, under pressure. Polyamide-forming reactants are for instance salts of diamines and dicarboxylic acids, amino carboxylic acids or derivatives thereof capable of condensation, such as esters or amides, amide-forming derivatives, having a substituted nitrogen, for instance urethans or formyl compounds of amino acids and diamines, these latter in conjunction with dicarboxylic acids. If the reaction mixture is a homogeneous liquid, the reaction proceeds more smoothly and quickly, since a much better and more uniform heat exchange is attained. The addition of water is generally such, that the reaction mixture contains considerably more water than is freed during the amide condensation itself. Of course the water which is added as well as the water formed during the reaction must be removed during the condensation.

In the polymerization of lactams which leads to nearly the identical polyamides as the condensation of the corresponding amino acids the addition of water to the reaction mixture is not necessary for the uniform progress of the reaction throughout the reaction mass, since the lactams usually melt without decomposition far below the reaction temperature and the melting point of the polyamides from amino carboxylic acids generally does not considerably exceed the reaction temperature. The usual addition of water or of reactants which set free water has the object to catalyze and accelerate the reaction by forming reactive amino acid molecules. In the process of polymerizing lactams therefore there is no distinct upper or lower limit for the water content of the reaction mass. Unless very little water is added, the steam formed during the lactam polymerization when working in a closed vessel must be driven off after the equilibrium is reached, whereafter the mass is heated while removing volatile reaction products, until no further splitting off of water by condensation occurs. For practical reasons the water content will only be made high enough to procure a satisfactory acceleration of reaction, especially since a more liberal addition of water seems to lower somewhat the degree of polymerization of the final product, even though water is incapable of forming stable reaction terminating end-groups. Such stable end-groups, however, are obtained by reactants which form heat-stable salts with reactive end-groups, for instance when alkalies are added which react with the carboxylic acid groups and on the other hand, if acids are added (such as hydrochloric acid, phosphoric acid, toluenesulfonic acid, and salts thereof with amino carboxylic acids or amines, preferably amines which can be acetylated or which are volatile) which react with the amino groups of the polyamides and prevent further condensation. By adding mono-functional reactants to the reaction mixture which react with the amino groups or carboxylic acid groups, for instance monocarboxylic acids or monoamines, it is also possible to form stable end-groups. It is, moreover, important to exclude oxygen from the reaction. By this means it is avoided that the quality of the polyamide articles obtained is impaired and disturbing resinous oxidation products are formed on the walls of the reaction vessel.

My present invention has as an object a new and improved discontinuous two-phase process for the preparation of linear polyamides from polyamide-forming reactants liquified below the reaction temperature, especially mixtures containing polymerizable lactams. Other objects will appear more in detail hereinafter.

Reference is made to the accompanying drawing which is a schematic view showing an apparatus for carrying out the process of my invention.

The object is accomplished by carrying out the first stage of the invention in the heated pressure vessel completely or nearly completely charged with the reactants, until the desired degree of reaction is reached. The pressure vessel preferably has a relatively small diameter, in order to attain a more uniform heat exchange. In the second stage of the process the liquid reaction mass is discharged into a relatively large receiver without previously removing the volatile products. In this receiver the heat treatment is continued and finished. Towards the end of the polymerization it is of advantage to heat the mixture under reduced pressure.

My present invention is a valuable improvement in this art, since it provides a process superior to the methods hitherto practised. By my process the duration of reaction in the pressure vessel can be considerably shortened, especially

when the vessel is heated during charging. The space available in the autoclave can also be utilized much better than in the processes hitherto known, since the valves are not clogged up when the pressure is decreased owing to the complete charging in contrast with the usual methods. Furthermore the overheating and resinification of the reactants on the walls of the vessel are avoided by the substantially complete charging with the reaction mixture. The residues of the batch are dissolved by the next batch. It is therefore hardly necessary to clean the vessel with special means. The receiver can easily be arranged so that its interior is accessible through holes or by detachable front walls. Finally it is more easily and simply possible in the practice of my process than in the known processes to exclude the atmospheric oxygen especially damaging in the first step.

As the further condensation is carried out in the independent receiver the reaction duration in the pressure vessel can be reduced to a minimum. The receiver can be constructed considerably lighter and therefore also more spacious, since it need only stand a good vacuum or at most a moderately high pressure up to about 5 atm. It is also possible to combine several batches in the receiver and to improve the uniform quality of the end product by stirring, if necessary by means of a stirring mechanism or by pressing an inert gas, for instance nitrogen. Receivers with flat bottom and elliptical cross section are preferred when monomeric substances, such as monomeric lactam in polymerizing ε-caprolactam, are to be removed in vacuo.

It is also possible to convert the polymer chemically in the receiver without any difficulty, as for instance by other polyamide-forming substances, especially such as do not contain lactam-forming reactants, as for instance salts from diamines and dicarboxylic acids, furthermore substances capable of controlling the degree of polymerization or inactivating catalysts, as for instance strong acids and derivatives thereof. These last-named substances for instance include alkaline reacting agents, such as potassium hydroxide, potassium acetate, potassium oleate, magnesium stearate, lithium-phenolate and sodium amino caprolactam. The substances can be introduced directly into the receiver by a pressure sluice or incorporated into the mass on its way from the polymerization vessel to the receiver. The boiling up of the mass in the receiver effects a homogeneous distribution of said substances. Inactivating agents added in excess can also be adapted to serve as stabilizers at the same time.

Physically reacting substances can likewise be added to the mixture in the receiver, such as pigments, resins, filling agents and preformed polyamides.

The process of this invention is applicable to liquified mixtures of polyamides, as for instance condensable salts dissolved in water, such as hexamethylene-diammonium adipate, pentamethylene-diammonium sebacate or s-dimethylhexamethylenediammonium adipate. The process is, however, of greatest value in using batches containing lactams and, if required, volatile reaction accelerators and/or polyamide-forming substances capable of producing volatile accelerators especially water or alcohols in the heat, such as amino carboxylic acids and amino carboxylic acid esters, salts from diamines and dicarboxylic acids and, if desired, further substances capable of accelerating or regulating the reaction or suitable for stabilization, as for instance acids as hydrofluoric acid, hydrochloric acid, phosphoric acid, benzenesulfonic acid or salts thereof with amines or amino carboxylic acids and monofunctional substances capable of forming stable end-groups, such as monocarboxylic acids, amines with one amide-forming amino group, and alcohols having a higher molecular weight.

In many cases the water content of the reaction mixture may be low. The mixture conveniently contains less than one mol of water for each amide group in the polymer, for instance $^1/_{100}$–½ mol. It is evident that the process is also adapted to carry out the reaction in the absence of water or compounds containing hydroxyl groups, for instance in the alkaline polymerization of lactams with sodium amide or organic alkali metal amides.

The less volatile substances are present or are formed during the reaction the more the space available in the autoclave can be utilized. It is advantageous to heat only such amounts of reaction mixture in the vessel that the pressure does not exceed 30 atm. However, the process is not limited to determinate pressures. In vessels having very strong walls it is also possible to carry out the reaction under higher pressures than mentioned above, for instance when methanol is present.

The pressure brought about by the reaction in the vessel may be partially compensated by allowing a portion of the reaction mixture to flow into an expansion vessel likewise heated to reaction temperature. Such an expansion vessel may, for instance, consist of a cylinder with a displacing piston or of an elastic member similar to high-pressure membrane pumps.

It is of advantage to fill the autoclave completely with the reaction mixture and then to press back a part of the mixture into the feed pipe by means of an inert gas (free from oxygen). The pressing back may also be effected by the pressure of the steam formed.

Instead of the usual manometer mounted at the upper end of the autoclave an opening closed by a resistant membrane is arranged at the lower part of the autoclave. When the pressure is too high, the membrane is torn and the mixture flows into an adjacent container.

Referring to the accompanying drawing, *a* is a cylindrical autoclave which has a relatively small diameter, consists of non-rusting refined steel (V4A) and tapers at its upper and lower ends. The autoclave is provided with a heating jacket *b* and connected at its upper part by a cock *c* with an over-flow container *d* which can electrically be heated to a temperature high enough to prevent the reaction mass from becoming solid. In its lower part said autoclave is connected by a three-way-cock *e* on the one hand with a—if required—heated pipe *f* and on the other hand with a container *h* having a flat, for instance elliptical cross section and being provided with a heating jacket *g*. *i* designates a graduated vessel connected with the cock *e* by pipes *k* and *f* separated by a three-way-cock *m*. Said cock *m* is furthermore connected by a piping *n* with a store tank *o* for the liquid starting material. Attached to the top of the container *h* is a fractionating column *p*, the lower part of which is protected from spraying substances by plates *q*. The container *h* can be emptied by a cock *r*. This apparatus works as follows.

The starting mixture kept in the liquid con-

dition in the heated container *o* and consisting, for instance, of ε-caprolactam and water or a substance capable of splitting off water at raised temperatures, such as amino undecoic acid, hexamethylenediammonium sebacate or hexamethylenediammonium adipate is pressed after the cocks *c* and *e* have been opened through pipes *n* and *f* into the autoclave *a* heated to 100° C. until the liquid has entered the over-flow-container *d* through the cock *c*. Said cock *c* is then shut off and the cock *m* turned so as to connect the autoclave with the graduated vessel *i*. Subsequently the autoclave is heated in such an extent, that a part of the liquid is pressed into the vessel *i*. When the cock *e* is shut off a maximum pressure of 20–25 atm. in the autoclave shall not be exceeded at the reaction temperature of 240° C. The portion pressed into the pipe *f* and the graduated vessel *i* is caused to flow back into the store tank *o*. For this reason it is preferred to give the pipe *f* a slightly inclined position. When the desired reaction degree has been reached, the autoclave *a* is connected with the container *h* by opening the cock *e*. Thus the reaction mixture is pressed into the container *h* by the pressure of the vapors in the autoclave. In the container *h* there is only a small pressure, for instance about 1–5 atm. adjusted by an exhaust steam valve. If necessary, the velocity of flow of the reaction mixture can also be increased by pressing an inert gas, such as nitrogen, carbondioxide or superheated steam through the valve *c*.

In the container *h* which, for instance, in polymerizing ε-caprolactam can be heated to 250–260° C the mass is after-condensed at atmospheric pressure for one to three hours. The volatile products as, for instance, monomeric lactam, are removed by reducing the pressure to 2–10 mm. The time required for this vacuum distillation depends upon the ratio of surface to quantity of the molten mass and amounts to about 15 minutes to two hours and more. In the container *h* the reaction mass may be mixed with stirring. This means is of advantage when substances are added in this second phase of the process which, for instance, regulate the final degree of polymerization or inactivate a catalyst or the like, such as the anion of a mineral acid. The molten polyamide is then fed to spinning machines or cast into films or worked up into rods and ribbons.

The molten final product can also be fed to a receiver in which several batches are mixed and from there to the working machines.

Example

A molten mixture of 100 mols of ε-caprolactam, 10 mols of water and 0.5 mol of ε-aminocaproic acid hydrochloride is pressed from below into the autoclave heated to 100° C until it is completely filled with the liquid. By pressing back a certain part of the batch, as described above, such an amount of polyamide-forming reactants is adjusted in the autoclave, that the pressure produced by this amount when heated to 240° C would not exceed 20–25 atms. The mixture is then heated to 240° C and kept at this temperature for 2.5 hours, whereafter it is pressed into a horizontal flat container which is under a blow-off pressure of 5 atm. In this container the mass is further heated to 250° C while the pressure is gradually reduced to atmospheric pressure. When the mixture has been after-heated at 250° C and 760 mm for 1.5 hours, the pressure in this container is gradually reduced to 3 mm, whereby the greatest part of the lactam not having reacted with the other substances is distilled off. After heating the mass at 250° C and 3 mm for one hour the molten polyamide is pressed by nitrogen pressure with the aid of a measuring pump to a spinneret to be worked up into bristles.

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PRODUCTION OF LINEAR POLYAMIDES

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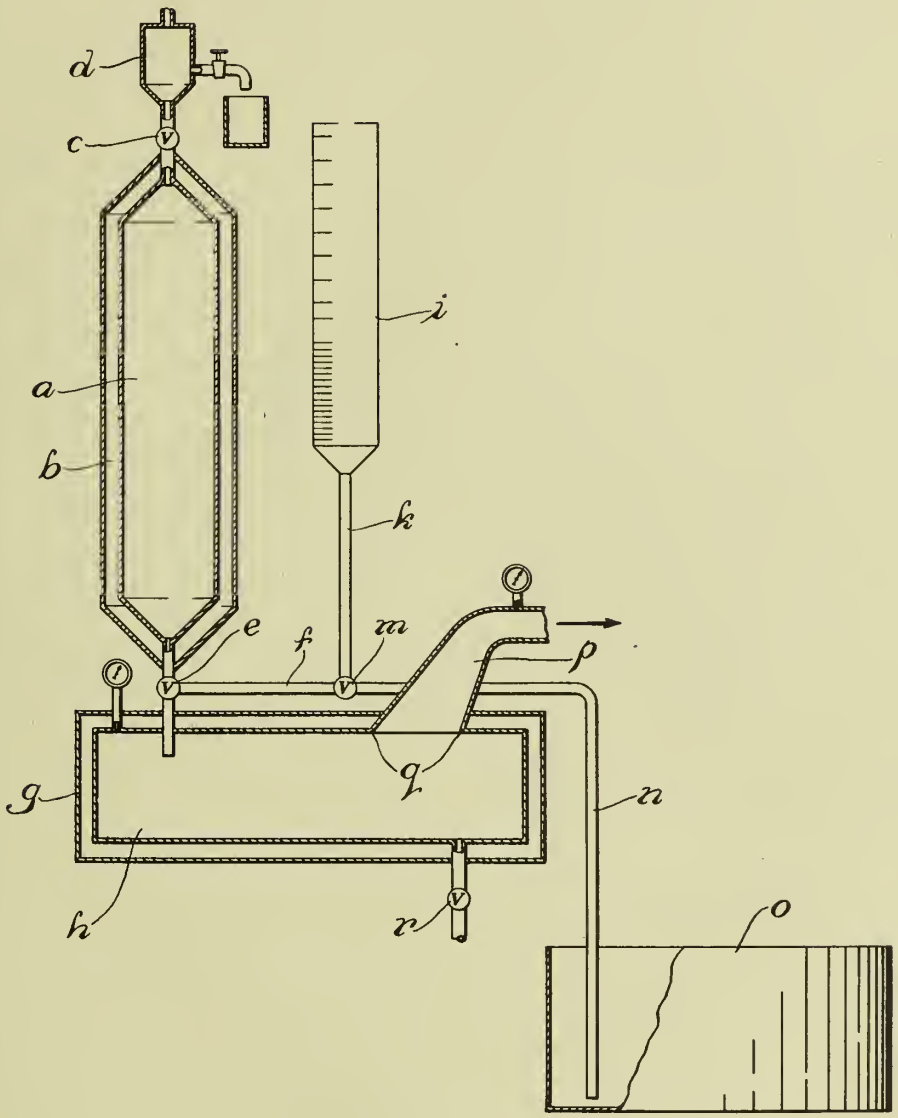

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ALIEN PROPERTY CUSTODIAN

AUTOMATIC CONTROL OF THE CIRCULATING PUMP OF CONDENSERS NORMALLY WORKING WITH NATURAL WATER CIRCULATION FOR PROPELLING APPARATUS

Francesco Modugno, Rome, Italy; vested in the Alien Property Custodian

Application filed February 8, 1941

In some propelling apparatus of fast ships the water circulation in the condensers is naturally obtained by conveniently shaping the water inlet and outlet openings at sea, so that it is possible to utilise the relative speed of sea-water with respect to the bottom in order to produce the head necessary for circulation.

Upon diminution of the ship's speed there ensues that the natural circulation diminishes remarkably in activity, but said activity may notwithstanding result equally sufficient because the quantity of steam to be condensed decreases contemporarily in a considerable degree. However, should one want to obtain an elevated vacuum in the condenser at low speeds, it may be necessary to keep the circulating pump in motion.

It may be indispensable in any case to keep the circulating pump in function when motion reversing manoeuvres are executed, because there are periods wherein the natural circulation is completely lacking and contemporarily the quantity of steam being discharged into the condenser may be remarkable and have a heat contents which is increased by the low efficiency of the turbines.

Should abrupt reversing manoeuvres have to be executed during navigation, the engine attendants or watch may easily neglect to immediately put the circulating pump in motion and this may cause inconveniences.

The object of the present invention is a controlling device automatically furnishing the driving machine of the circulating pump with steam when the natural circulation is lacking or insufficient and taking off steam on the other hand when the natural circulation is restored with its necessary activity.

The fundamental feature of the device according to the invention consists in the fact that within the piping for admission of steam to the driving machine of the pump, a valve subjected to an actioning device obeying to flexible calibrated means constantly tending to open the valve, and simultaneously subjected to a moveable body acting in counter sense to said flexible calibrated opening means is inserted and pressed by the difference between the hydrodynamic pressures generated within two piezometric tubes the lower ends whereof are immersed in the same water as the ship and are directed towards the bow and stern of the ship respectively.

Said moveable body may comprise a deformable diaphragm mounted within a watertight casing and dividing the cavity thereof into two chambers respectively in communication with said two piezometric tubes. Said body may be also constituted by a piston running within a watertight cylinder and dividing the cavity thereof into two chambers respectively in communication with said two piezometric tubes. The moveable body may also be formed by a mass of oil comprised between two masses of mercury in a watertight piping at the ends of which the piezometric tubes already mentioned terminate.

The operation of the control valve for the steam admission to the motor of the pump may take place by means of a direct mechanical connection or through a fluid as for instance the aforementioned lubricating oil or also electrically by means of an electromagnet.

The connection between the moveable body and said actioning device that the valve is subjected to, may in its turn be rigid and in this case the moveable body and the valve move in the same direction, or it may occur by means of a device impressing to the valve control device to move in the same direction as the moveable body or to always move in the same direction whatever may be the direction of the movement of the moveable body. Even in this last case the connection may occur by means of mechanical devices or by means of an electric current in circuits which, by two parallel couples of contacts, are alternately closed by said two masses of mercury.

In the accompanying drawings some preferred forms of realisation of the invention are illustrated by way of explicative and limitative examples.

Fig. 1 shows in a diagrammatic comprehensive view a first example; Fig. 2 shows a detail thereof in axial section; Fig. 3 shows a further example of realisation in an axial, fragmentary section; Fig. 4 shows another example of realisation in a semi-diagrammatic way.

According to the example illustrated in the Figures 1 and 2 a casing **3** is subdivided by the corrugated diaphragm **4**, into two chambers, the lower one communicating with the sea by means of tube **1**, having an opening directed bowwards, and the upper one communicating with the sea by means of tube **2** having an opening sternwards. The diaphragm upon deformation transmits the movement to the piston **8** of distributor **9** by means of the rod **5** on which the spring **6** the compression of which is regulated by nut **7**, also operates.

The oil under pressure derived from the lubrication piping is sent into the cylinder **10** above or beneath the piston **11** by the distributor **9**

while the oil on the opposite side is discharged through the same distributor.

The piston 11 lastly opens or closes valve 12 of an equilabrated type, which admits the steam into the motor of the circulating pump through regulating valve 13.

Supposing the ahead speed of the ship, indicated in the figure by arrow V, be such as to produce a sufficient natural circulation of the refrigerating water in the condenser, the pressure within the lower chamber of casing 3 results greater than that in the upper chamber owing to the direction of the openings of tubes 1 and 2 on seawards side: consequently the corrugated diaphragm will be inflected upwards compressing the spring 6 and causing the small piston of the oil distributor to be lifted. The oil under pressure will enter into the lower part of cylinder 10, while the upper part will be put in communication with the discharge piping, and piston 11 will rise closing valve 12, and thus obstructing the passage of steam to the circulating pump motor.

Should the ship run ahead or astern at a low speed as is often the case during manoeuvres, the difference of pressure between the two chambers of casing 3 is small and the rod of the oil distributor under the overwhelming action of spring 6, is displaced downwards producing the opening of valve 12.

By screwing the nut 7 up more or less, the compression of spring 6 is varied and consequently the advancing speed of the ship at which the passage from the natural to the forced speed and vice versa takes place, is controlled.

Rod 14 connecting piston 11 with the obturator of valve 12 has a projection 15 running within sleeve 16. This sleeve, as illustrated in the figure, may be displaced upwards or downwards by means of handwheel 17. When this sleeve is at the end of its downward stroke it causes the immobilisation of the valve 12 in the opening position by means of the projection 15 when it is at the end of the upward stroke on the other hand the valve's movements are left free so that said valve obeys the apparatus for the automatic manoeuvres above mentioned.

When valve 12 is immobilised in the opening position the steam admission into the circulating turbo-pump may be regulated by hand by means of valve 13. The possibility of hand opening valve 12 has been studied not only to permit a modification of the automatic manoeuvre, but also for the case of a strong lowering of pressure in the lubricating piping rendering automatic manoeuvre impossible.

Of course in order to bring valve 12 into the opening position by means of the handwheel 17 the passage of the oil from the bottom to the upper part of the cylinder 10 must be permitted; this is accomplished by spring valve 18 which opens when the pressure under the piston overcomes a determined value.

In the case of tubes 1 and 2 being obstructed owing to the introduction of foreign bodies through the sea communication ports, the obstruction may be removed by turning of 90° (by a single manoeuvre) the two threeway cocks 19, 20 and supplying fresh steam by means of the valve 21. The interception of the piping branches directed to casing 3, executed through the two cocks, is necessary in order to avoid that the steam pressure should damage corrugated diaphragm 4 which being easily deformed with a limited head, cannot have such a thickness as to resist the steam pressure without inconveniences.

The described system for the automatic control of the circulating pump allows, in its practical realisation, changes which cannot alter its fundamental principle. The casing 3 may for instance be replaced by a cylinder having its piston connected with the small piston of the oil distributor, the two tubes 1 and 2 being respectively connected with the bottom and upper part of the cylinder.

The described device relates to the normal case that, even when the discharge outlet of the circulating conduit is decidedly directed towards the stern, the speed of the ship in reverse gear may never reach such values as to produce a tendency to reverse the sense of the circulation such as to sensibly impede the action of the pump (which is not reversible).

There are however special ships destined to navigate indifferently in both directions, wherein it may be convenient to have a natural circulation for both directions of motion.

It is then necessary to take off steam from the motor of the pump when the water naturally circulates within the condenser whatever the direction of the motion may be.

This result may be obtained in different ways. As an illustrative (non limitative) example two solutions may be mentioned, one with a mechanical, the other with an electric device.

The first solution is illustrated in Fig. 3.

Rod 22 actioned by diaphragm 4 is not directly connected to the small piston of the oil distributor, but transmits movement to the latter by means of the rod 23. To the latter sleeve 24, provided with a hole wherein the upper end of the rod 22 slides, is screwed. When the pressure within tube 1 is greater than that within tube 2, diaphragm 4 is deformed upwards and causes rod 22 to be lifted. The upper end of this rod strikes on the bottom of the hole of sleeve 24 and overcoming the resistance of spring 25, causes rod 23 and the small piston of the oil distributor to be also lifted upwards.

With the rod 22 there is rigidly connected the cross-bar 26 the position whereof is regulated by means of nuts 27 and 28; the two connecting rods 29 which have the other end articulated to one end of the swinging levers 30, are joined to rod 22; these, by means of the connecting rods 31, cause cross-bar 32, which slides along the rod 22 by running equal strokes but in opposite sense relative to the latter, to be parallelly raised or lowered.

When the advance direction of the ship is reversed, the pressure within tube 2 becomes greater than that within tube 1 and diaphragm 4 is deformed downwards: the diaphragm, by transmitting the motion through the described members, lift crossbar 32 which strikes against the lower end of the sleeve 24 determining the raising of the small piston of the oil distributor as was the case when the diaphragm was deformed upwards.

The consequence is that when the ship has a sufficient-high speed, whatever the advance direction of the same may be, the small piston of the oil distributor is always displaced upwards causing the closure of valve 12 shown in Fig. 1.

When the ship is stationary or moves at a low speed, the difference of pressure between tubes 1 and 2 is small and it is not sufficient to compress the spring 25, therefor this spring pushes the rod 23 downwards and the oil under pressure, by operating on the upper part of the piston 11, Fig. 2, causes valve 12, Fig. 1, to be opened so

that steam is introduced into the motor of the circulating pump.

As already mentioned the position of crossbar **26** is regulated by means of nuts **27** and **28**; this regulation must be executed in such a way, that when the diaphragm is neither deformed upwards, nor downwards, the play between the end of rod **22** and the bottom of the hole in sleeve **24** results equal to that between crossbar **32** and the lower end of the same sleeve. The weight of rod **22**, of crossbar **26**, of nuts **27**, **28**, of connecting bars **29**, **31** and of crossbar **32** are to be regulated in such a way that the resulting total weight, which, through rod **22**, acts on the diaphragm, be approximately equilibrated by the hydrostatic thrust acting in the medium conditions of immersion of the ship on the surface corresponding to the section of rod **22**.

The second solution (with electric device) is illustrated in Fig. 4.

Piezometric tubes **1**—**2** end with their openings in the upper part of the two containers **33** and **34**; to these there are joined branches **35**—**36** of the two U-tubes while the branches **37** and **38** are in communication by means of the crossbar **39**. The two U-tubes are filled with mercury as far as half the height of the two containers; above the mercury, the two branches **37** and **38** and the crossbar **39** are filled with oil.

In correspondence with the tube branch **37** two small iron rods **40** isolated relatively to each other and penetrating into said branch up to a small distance from the mercury level, are fixed to the cross-bar. Furthermore, in correspondence with tube branch **38** the two similar small rods **41** are fixed.

The small rods are electrically connected to the relay **42** as shown in the figure, and the nucleus of the relay transmits the movement to rod **43** of the small piston of the oil distributor.

The operation of this detail of the apparatus is the following.

If the ship moves in such a way as to increase the pressure within tube **1** and to diminish that within tube **2**, the mercury level in the container **33** is slightly lowered and is raised slightly in container **34**, while within the branches **37**, **38** its difference is more sensible. If the speed of the ship is sufficiently high, the mercury in branch **37** achieves contact with the ends of small iron rods **40** which are in the same branch, and closes the electric circuit. The relay by attracting the nucleus pushes the rod **43** upwards and consequently the small piston of the oil distributor and this, also already mentioned above, produces the closure of the steam valve.

If the ship moves in the opposite direction, the mercury rises within tube **38** and closes the circuit by means of two small iron rods **41** which are in the same tube and the closure of the steam valve is thus produced.

If the ship is stationary or has an insufficient speed, the circuit is not closed and the small piston of the oil distributor, under the action of a spring similar to the one indicated with reference number **25** in Fig. 3, remains lowered and keeps valve **12**, Fig. 1, open.

The speed of the ship beneath which steam is supplied to the circulating pump, is regulated by regulating the up screwing of plugs **44**, **45** to which the small iron rods are fixed, so that the distance between these and the mercury level, when the pressure is equal within the tubes **1** and **2**, may be varied.

The two containers **33** and **34** have been designed with object of obtaining, for an equal difference of pressure between the tubes **1** and **2**, a greater excursion of the mercury level in the branches of tube **37** and **38**.

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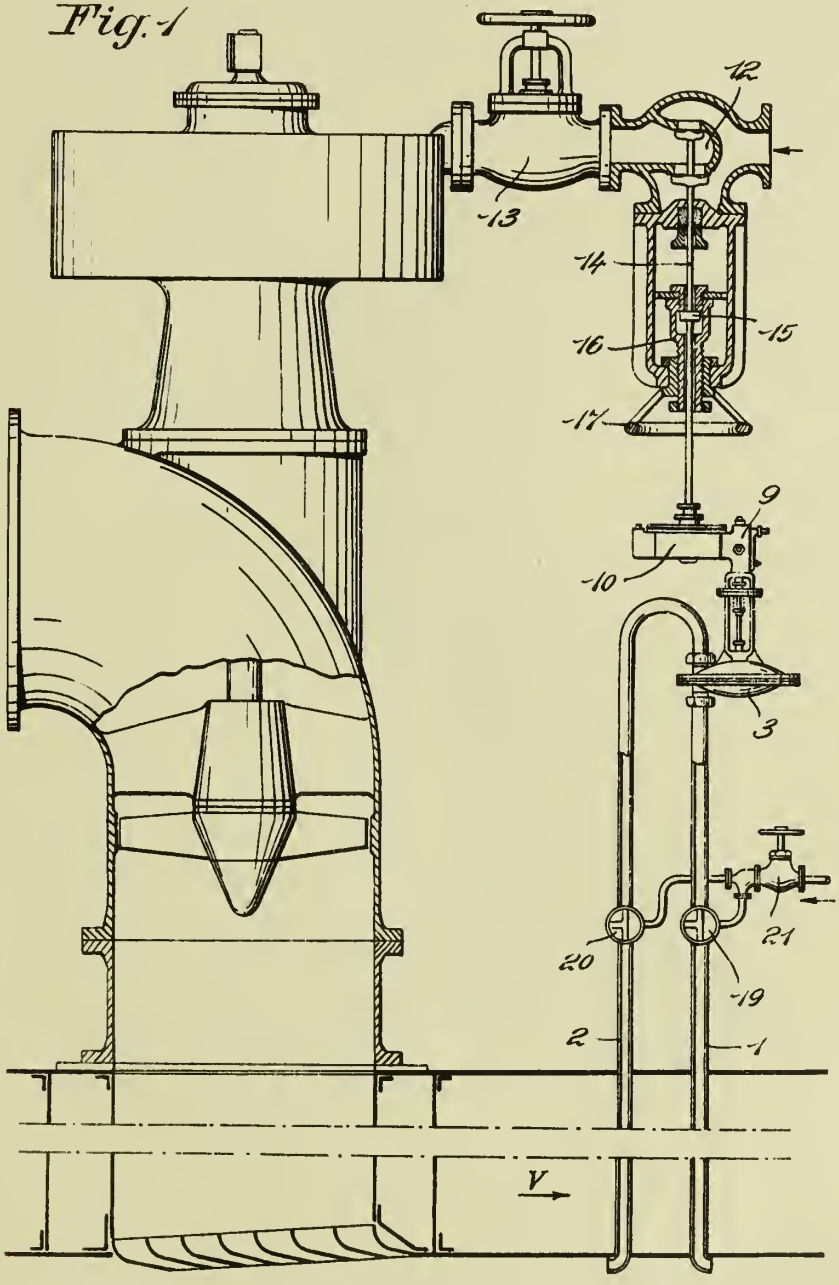
Filed Feb. 8, 1941

Serial No.
378,096
4 Sheets-Sheet 1

Fig. 1



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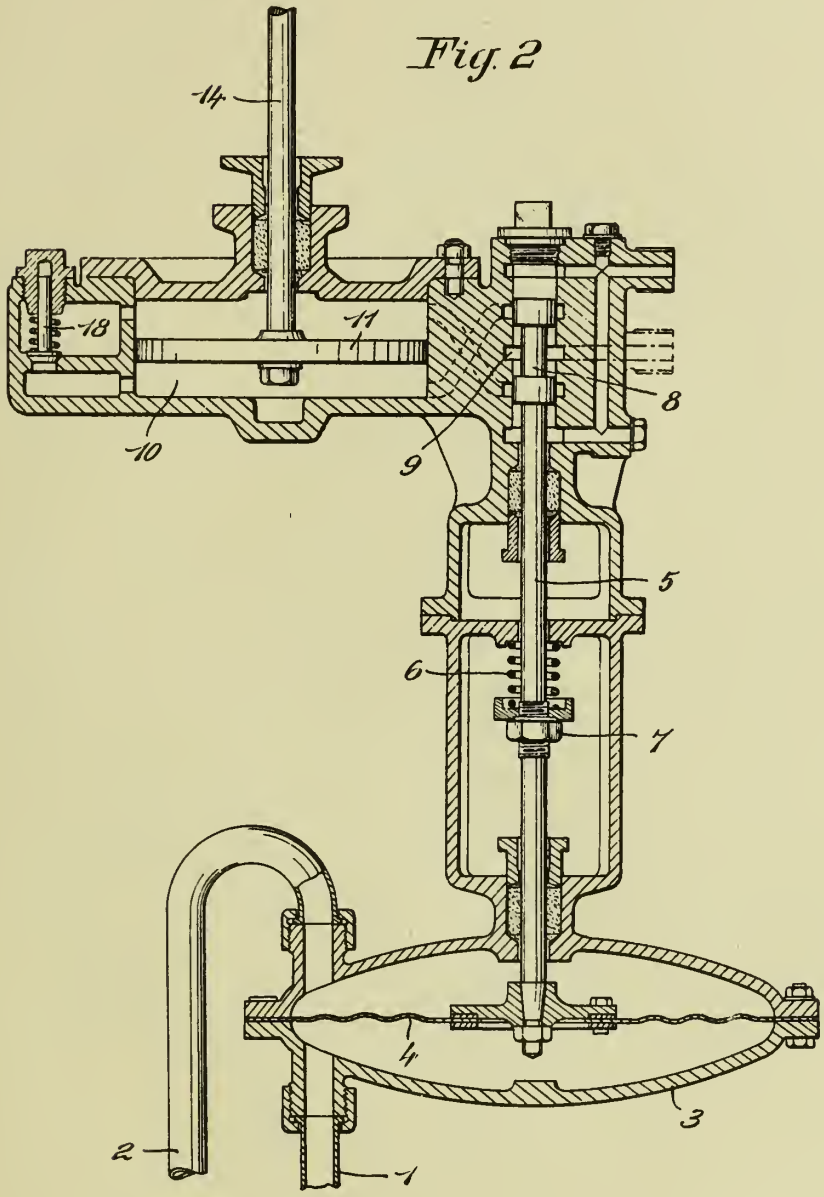
4 Sheets-Sheet 2

Fig. 2



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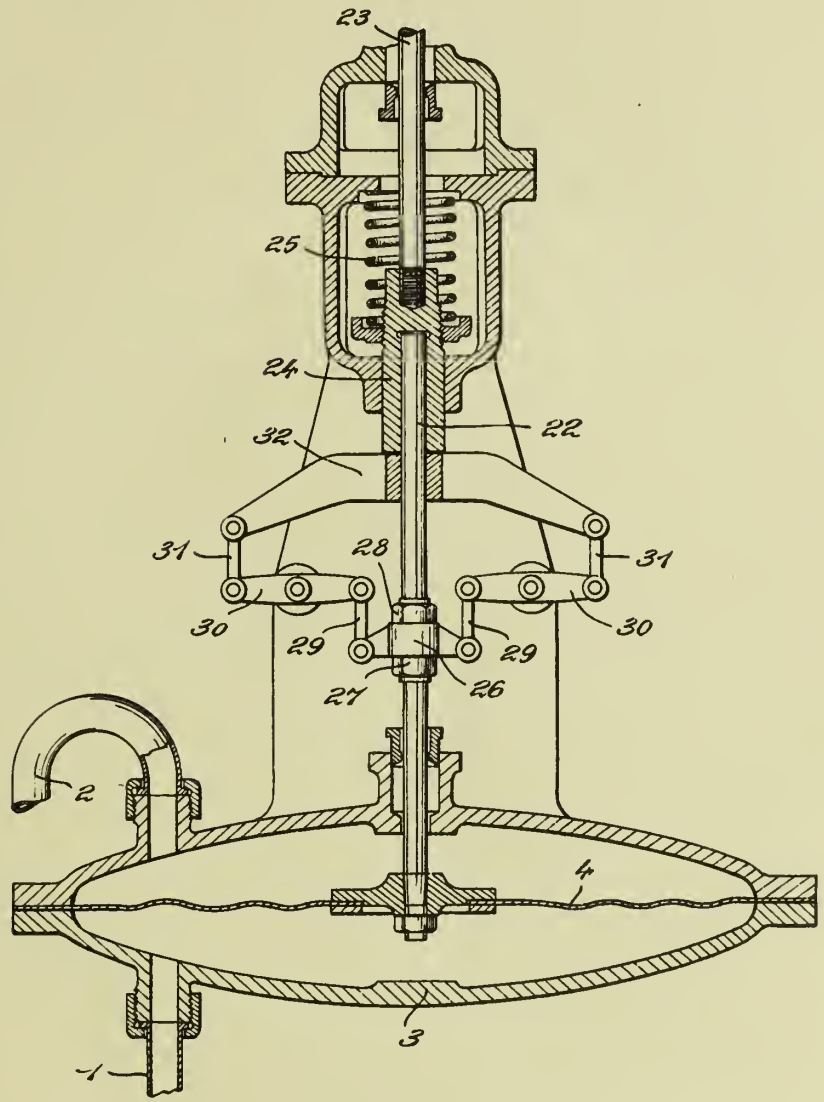
4 Sheets-Sheet 3

Fig. 3



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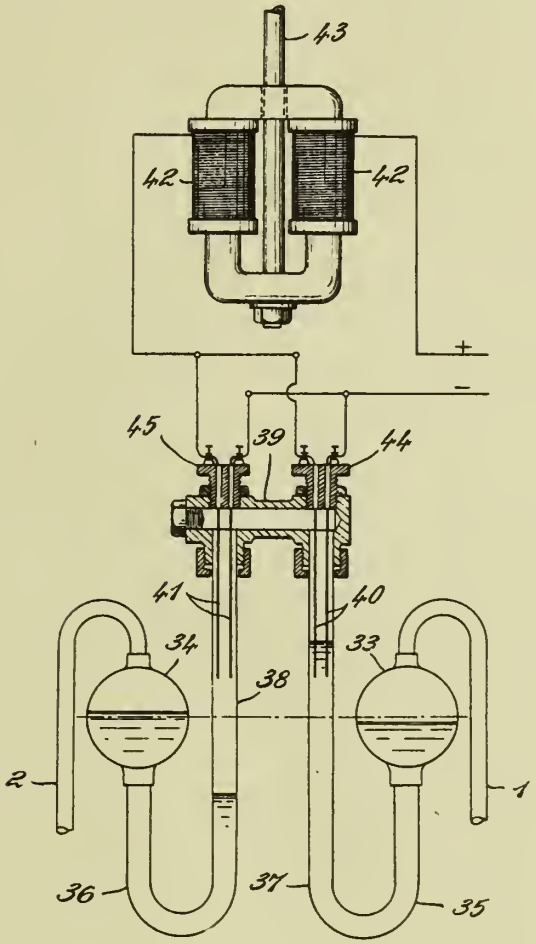
4 Sheets-Sheet 4

Fig. 4



Inventor,
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Published June 22, 1943 Serial No. 382,639

ALIEN PROPERTY CUSTODIAN

PROCESS FOR THE PREPARATION OF HIGH GRADE ANTI-KNOCK MOTOR FUELS

August Hagemann, Duisburg-Meiderich, Germany; vested in the Alien Property Custodian

No Drawing. Application filed March 10, 1941

Unsaturated low molecular hydrocarbons, such as are obtained for example in the catalytic cracking of high molecular hydrocarbons, can be converted into highly anti-knock gasoline polymerisates. However, in hydrogenating these polymerisates, which is absolutely necessary for applying these motor fuels to aircraft purposes, the anti-knock property of the gasoline is greatly decreased.

It has been recognized that these hydrocarbons, especially those with from 3 to 5 carbon atoms, can be most satisfactorily converted into a product which, even after hydrogenation, has an excellent anti-knock property. To obtain this result, the low molecular hydrocarbons are treated with carbon oxide and hydrogen at high pressures of about 50–200 atm overpressure, and temperatures of up to, and if necessary above, 300° C. (572° F.) at which alcohols are formed, which thereupon are converted at normal pressure into alkenes with ramified chain, by the usual process of heating with dehydrating means, such as alum earth. Subsequently, a hydrogenation takes place. If desired, this treatment with carbon oxide and hydrogen may be repeatedly carried out with the alkenes obtained, until the hydrogenated final products show the boiling properties required for application as aircraft gasoline.

Before the watergas treatment it is advisable, to introduce a selective polymerisation, whereby only the iso-hydrocarbons are polymerised. Then, by the addition of a methyl group through the watergas treatment, the polymerisates obtained yield compounds which, as regards their anti-knock property, even surpass iso-octane.

Furthermore, before the watergas treatment, it is advisable to treat the starting material with borylphosphate, fuller's earth or similar substances at a high temperature, for example at 200°–300° C. (392°–572° F.), partly in order to isomerise the unsaturated hydrocarbons, and partly to shift the double binding towards the middle of the molecule, which is very favourable for the ramified addition of the methyl group through the watergas treatment. In the same way, the final hydrogenation can be preceded by another treatment with agencies such as borylphosphate, fuller's earth, etc.

A very favourable mode of execution of the above described process results if the products with a boiling range of gasoline, which have been obtained by dehydration, are separated. The low molecular hydrocarbons are then subjected to the treatment with isomerising means which precedes the watergas treatment, while the medium molecular hydrocarbons are conducted to the watergas treatment used for the preparation of alcohols, if desired after the treatment with borylphosphate, etc. On the other hand, the higher molecular fractions, if desired after further treatment with borylphosphate etc., are immediately subjected to hydrogenation. In this way, for example, it is possible to effect a thoroughly satisfactory conversion of the C_3- to C_5-hydrocarbons, obtained in large quantities by the catalytic cracking, into valuable aircraft gasoline.

If desired, one can add to the aircraft gasoline the saturated C_5-hydrocarbons, which during the watergas treatment are given off together with the saturated C_3- and C_4-hydrocarbons that escape as gases, while the latter may be used as fuel gas.

The process allows a practically complete conversion of the C_3- to C_5-hydrocarbons, especially obtained in large quantities by the catalytic cracking, into an aircraft gasoline with a remarkably high octane number. In this connection it should be observed that this conversion can be effected by comparatively simple means.

AUGUST HAGEMANN.

Published June 22, 1943 Serial No. 395,452

ALIEN PROPERTY CUSTODIAN

AUTOMATIC LATHES

Georges Emile Cuttat, Paris, France; vested in the Alien Property Custodian

Application filed May 27, 1941

The object of the present invention is an automatic lathe with movable head stock, comprising a number of members suitably cooperating for forming various manufactured articles starting from a bar of suitable profile.

Automatic lathes of this type with a movable head stock are already known, in which each motion is dependent upon a cam, the profile of which determines, in the cycle of production, the motions of the tools precisely at the required moments.

In the lathe according to the present invention, the various members have been designed with the view of avoiding all lateral reactions upon the stress transmitting parts, the transmission being effected from the control member (cam or other) to the controlled member in one single plane perpendicular to the axis of the control member, the lathe being characterised by the fact that the transverse carriages are controlled by a number of levers and connecting rods respectively arranged in a plane perpendicular to the axis of the control member.

The arrangement of the cams may be designed in a manner to facilitate their replacement. They are fixed to two shafts perpendicular to one another.

The main cam shaft and its controls may be arranged on the front side of the lathe, thereby greatly facilitating their access. One of these cams may control the motion of the head stock by means of two levers arranged in two planes perpendicular to one another and by a slide interposed between the two for transmitting the motion from one of the levers to the other as described in the patent application filed August 3, 1939 by Société de Manufacture de Machines du Haut Rhin, for "Improvements in automatic lathes."

A lathe according to the present invention is described below by way of example and illustrated on the joined drawings, in which:

Figure 1 is a front elevation,

Figure 2 is a side elevation from the side comprising the drive of the head stock,

Figure 3 shows a detail of the coupling and the mounting of the cam shaft, and

Figure 4 is a rear elevation.

The lathe is driven from an electric motor 1 mounted in a cradle 2 which may oscillate about pivot 3 fixed to the cup-shaped frame member 4 (Figure 2). The motor 1 drives through the means of belt 5 the main shaft 6 which sets up the independent rotations controlling the spindle-carrying head stock, the cam shaft, the drilling, the inside screw cutting and other devices, the rotations of these various parts remaining independent from one another.

Shaft 6 controls directly, over belt 7, the rotation of the spindle carrying shaft 8.

Said shaft 6 is specially supported by a movable bearing 9 which may be rapidly dismounted and thus permits the introduction or eventual replacement of belt 7 without requiring a dismantling of any other part. It is thus possible to use an endless belt.

A pulley 11 keyed to shaft 6 drives, over a belt 12, another pulley 13 driving an endless screw 14 acting, over suitable gears forming a variable speed device, on a pulley 15 driving over belt 16 the endless screw 17 meshing with a gear drilled in 18 and keyed to the cam shaft 19.

On the other hand, motor 1 may drive, over a belt 21 (Figure 2) a bevel gear 22 acting, over pulleys 23, 24 and belt 25, upon the shaft of the endless screw 17. On this shaft is interposed a friction cone clutch 26 permitting, by means of a lever 27, to couple with the screw 17 either of the drives coming from motor 1, at will, and thus to cause the cams to rotate faster during the non working periods.

The shaft 19 carrying the cams 27 (detail on Figure 3) is formed of two portions with a certain interval between their ends and connected by a coupling muff 28 according to the French patent application filed August 1st, 1939 by Société de Manufacture de Machines du Haut Rhin, for "Device for coupling two shafts in line." By moving the coupling muff 28, it is possible to set free the interval between the shaft ends for extracting or inserting the cams 27 when these are being replaced by others.

The position of these cams 27 and the drive of the working carriages have been especially designed with the view of avoiding all transverse stresses on the axes and levers.

The cam shaft 19 carries a cam 30 in contact with a roller 31 mounted on a lever 32 pivoted on a pin 33. A second roller 34 carried by lever 32 is in contact with a slide 35. The latter moves along a straight line while the contact of roller 34 with it lies on a curve with a large radius, connecting its extreme points, without friction however, the latter being avoided by the rotation of roller 34 about its axis.

The same also holds for roller 36 actuated by the slide 35. The two rollers 34 and 36 will therefore always move with the same amplitude, without deformation. Roller 36 is further integral with a lever 37 acting directly upon the head

stock 38 by means of a sliding member 39 adjustable in position. This adjustment has the object of varying the leverage and thus varying the stroke obtained on the head stock with respect to the initial stroke of the cam, the direct action lever arrangement itself having but little reaction upon the pivoting centres, permits in this case to increase the arc of the lever arms and it is thus possible, in this solution, to obtain, without at all enhancing the precision, a larger stroke of the head stock as that obtained normally on the cam, this constituting a considerable advantage of this device. For the detail of said control, reference should be made to the French patent application filed August 3, 1939 by Société de Manufacture de Machines du Haut Rhin for "Improvements to automatic lathes."

The cam shaft 19 arranged in front of the machine thus enables an easy adjustment of all movements, all the corresponding parts being readily accessible; the dismounting and adjustment of the cams are facilitated by the adaptation of a rigid coupling muff 28.

The position of cams 27 has been specially designed in order that the device for contact on the cam, the transverse axes of the levers, the connecting rods and adjustable contact screws pushing the working carriage remain constantly in the same plane, thereby considerably decreasing the stresses exerted on the corresponding parts and suppressing entirely all transverse bending reactions upon the axes and levers, which is a very particular advantage for this machine.

For the control of the longitudinal motions with respect to the machine axis and for maintaining the principle of directly distributed forces, it has been necessary to resort to the use of a cam shaft member 40 perpendicular to the main shaft 19; the connection of both these shafts is effected by a bevel gear 49 with spiral teeth. The position of the cams 27 has here again been designed in order that the contact on the cam, the push on the carriages and the pivoting centre of the levers be arranged along a same line coinciding with the lever axes.

The machine illustrated by way of example on the drawing comprises four tool-carrying carriages 41, 42, 43 and 44, one of which, 41, may be swung over, and each of them carrying one or more tools. The carriage 41 of a known type is embodied with a direct drive from the cam 27 and comprises two tools arranged symmetrically with respect to the bar under work and which may only come into contact with the latter alternatively. The other tools, on the contrary, are independent and may work simultaneously or in succession. They are carried by carriages 44, 45 and 46 driven directly, so that the forces transmitted from the contact point of the roller on the cam up to the push-point on the slide lie in one same plane, the latter transmission being effected over the levers 50, 51 and 52 bearing on the cams, over the intermediate connecting rods 53, 54 and 55 and the levers 56, 57 and 58 driving the carriages. The carriage 44 alone comprises further an intermediate lever 59 and a connecting rod 60, but its transmission device still satisfies the principle of transmission forces all lying in a same plane.

Apart from the tool carrying carriage, the machine may be fitted in addition with devices for forming the end of bars, with devices for the various simple or composite drilling, threading and boring operations, according to the particular uses of the machine, and, eventually, with auxiliary apparatus for drilling, threading and other operations, supplied by transport arms.

GEORGES EMILE CUTTAT.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

G. E. CUTTAT

AUTOMATIC LATHES

Filed May 27, 1941

Serial No.
395,452

2 Sheets-Sheet 1

Fig. 1

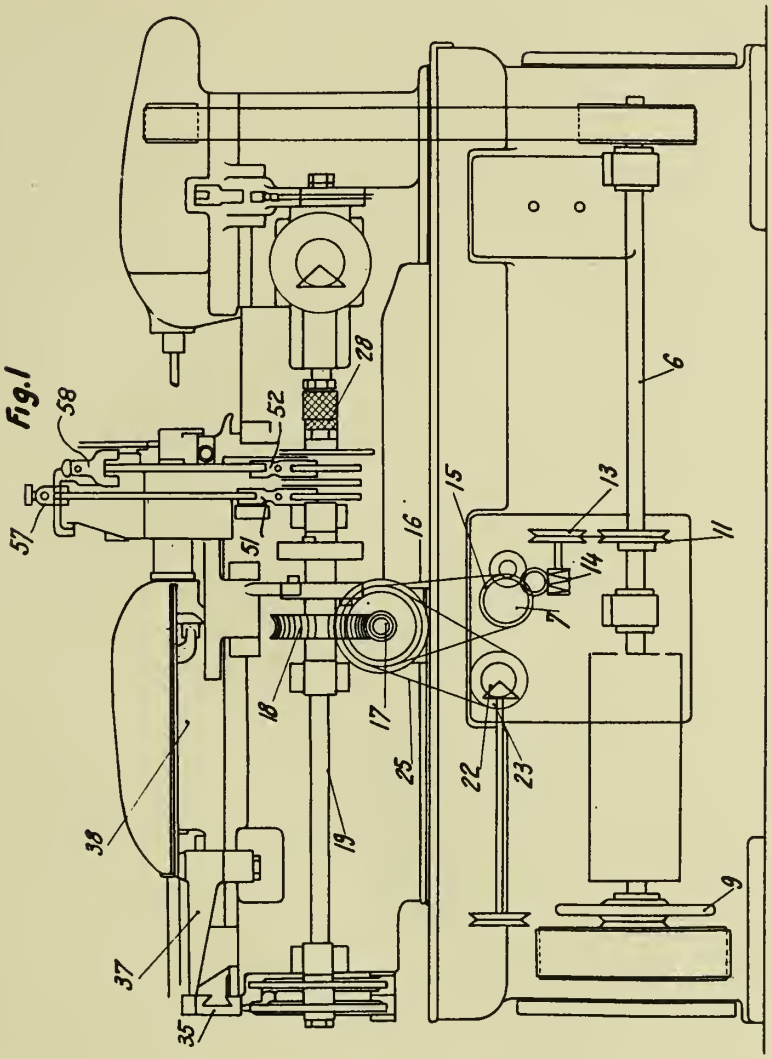
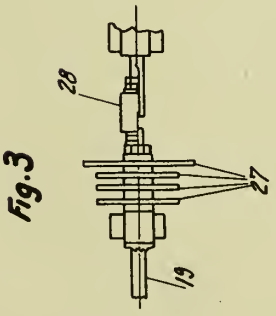


Fig. 3



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By E. F. Wenderoth
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G. E. CUTTAT
AUTOMATIC LATHES
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2 Sheets-Sheet 2

Fig. 4

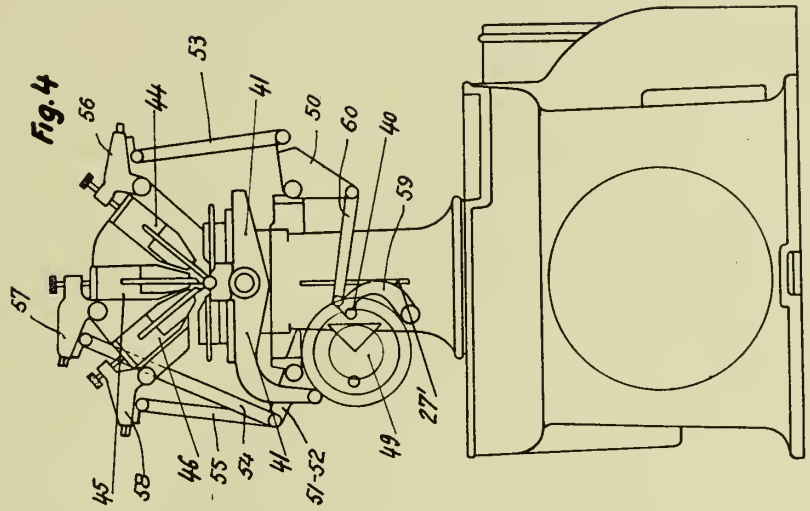
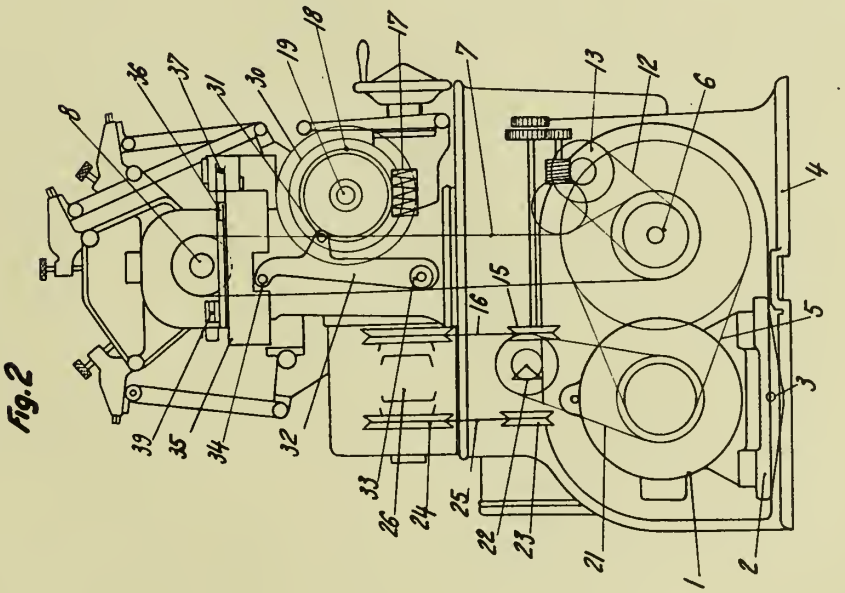


Fig. 2



Inventor:
G. E. Cuttat,
By E. F. Wendroth
Atty

Published June 22, 1943 Serial No. 409,398

ALIEN PROPERTY CUSTODIAN

BLOCK FOR CARRYING THE TOOL CARRIAGES OR TOOL HOLDERS SHIFTABLE ON THE SIDE FACES OF THE BLOCK ON ONE-SPINDLE OR MULTIPLE SPINDLE TURRET LATHES

Erwin Kohring, Cologne-Poll, Germany; vested in the Alien Property Custodian

Application filed September 3, 1941

For holding the tool carriages shiftable on the sides of a block in one-spindle and multi-spindle turret lathes prismatic guides or dove-tail guides have been used up to the present.

The present invention has for its object to provide a form of construction, for the block as carrier for the carriage or tool holder, which is simpler to produce, more accurate and more favorable as regards space. This is attained especially thereby, that the slip guides of the block for the carriages or tool holders are formed by inwardly curved carrying faces, preferably extending arc-shaped and arranged in star-shape the one relative to the other. If tool carriages are employed as carriers of the tools, they consist of parts of full or hollow cylinders adapted to the slip guides of the block, preferably of the same cylinder, and longitudinally cut parallel to the axis, the tools being accommodated on straight or cylindrically curved inner faces of these cylinder parts. It is further of advantage if the axes of the cylinder faces forming the slip guides or bearings coincide on the block unit with the axes of the tool spindles. Ledges fixed by screws on obtuse edges of the block then secure the carriages in the trough-shaped path for holding them. Instead of carriages the feet of the tool holders directly may be curved cylindrically.

An embodiment of the invention is illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows in side elevation the block unit with the carriage and the tool holder built into a multi-spindle lathe,

Fig. 2 the block without carriage in side elevation,

Fig. 3 the block in front elevation,

Fig. 4 the carriage without block in top plan view,

Fig. 5 the carriage in front elevation with straight inner holding face for the tool holder,

Fig. 6 the same view as Fig. 5 however with cylindrical inner face for holding the tool,

Fig. 7 the block with carriage in front elevation,

Fig. 8 half of the block in front elevation with the usual prismatic guide,

Fig. 9 half of the block in front elevation with the usual dove-tailed guide.

Between spindle stock 1, as shown in Fig. 1, and gear box 2 of a four spindle lathe a block 4 with carriage 5 is mounted on the axle 3 so that it cannot turn about this axle, only one of the four tool holders 6 being shown in Fig. 1. The carriages are driven in known manner by push rods 7. The block 4 having a bore 8 for the axle 3 is originally a four-edged piece, between the four corners of which inwardly curved cuts having cylindrical faces 9 are made by turning and grinding. The radius of each incurvation is of such length that, when the block 4 is built in, the longitudinal axes 10 of the incurvations coincide with the longitudinal axes of the tool spindles 11.

The tool carriages or slides 5 consist, as shown in Fig. 4, of parts 12, as shown in Fig. 5, of similar size of a full cross-section cylinder cut parallel to the axis, these parts fitting into incurvations 9 and have a straight tool holding face 13, or of the parts 14 as shown in Fig. 6 of a semi-hollow cylinder, the cylindrical inner surface 15 of which serves for holding the tools. In both forms of the carriage the extension 16 may be left, on which the push rod 7 is fixed. The carriages may, however, be cut from a completely hollow cylinder, similar to part 14, but without extension 16, for instance if more room is required for special tools and for the drive of these tools, the form of construction being not shown on the drawing. Also in this case a connection with the push rod can be easily made.

In order to guide the carriages in their corresponding incurvatures, ledges 16 are fixed by screws on the obtuse edges 17 of the blocks, as shown in Figs. 3 and 7, said ledges extending each one over two adjacent short sides 19 of the carriages.

The invention shows in comparison with the commonly used prismatic or dove-tail shaped guides for the tool carriages as shown in Fig. 8 and 9 various very appreciable advantages.

One of these advantages is, that the cylindrical bearing faces of the block and tool carriage can be produced easily and very accurately in the simplest manner by turning or milling and grinding, whereby it becomes possible to interchange the carriages the one against the other. The surface contact is also very great. Prismatic guides or dove-tail guides can not be produced so easily with the desired high accuracy owing to the numerous faces due to their shape or profiling, so that it is not possible to interchange the carriages. The face contact is also less great in these profiles, and consequently the wear is greater.

According to the invention a particularly great advantage is obtained as regards the space required for the cutting tools of large diameter, such as screwing chucks, and also as regards

mounting of driving elements for instance for circulating drilling tools. When comparing the block-and-carriage profiles shown in Fig. 7 with those shown in Figs. 8 and 9, the difference between the turning diameters **20**, as shown in Fig. 7, and the turning diameters **21** as shown in Fig. 9 can be easily seen. This advantage results from the cylindrical shape of the guiding- slide- and holding faces **9**, shown in Fig. 3, or **12** or **14** as shown in Figs. 5 and 6, and to even higher degree in the faces shown in Fig. 6. If the axes of curvature of the faces on the block and carriage coincide with those of the work spindle, a tool adjusted centrically or eccentrically, such as a drill, will assume in any of the block curvatures at once always the same position relative to the centre of the work. The block **4** of star-shaped cross-section is not in the least inferior as regards resistance to the blocks of known construction.

The obtuse block ends further form a comfortable support for stationary elements, such as copying ledges in back cutting works and the like, without the necessity to make the carriage guides narrow.

The same advantages are obtained, when the feet of the tool holders are made directly carriage like, i. e. are cylindrically curved.

ERWIN KOHRING.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

E. KOHRING

BLOCK FOR CARRYING THE TOOL CARRIAGES OR TOOL HOLDERS SHIFTABLE ON THE SIDE FACES OF THE BLOCK ON ONE-SPINDLE OR MULTIPLE SPINDLE TURRET LATHES

Filed Sept. 3, 1941

Serial No. 409,398

Fig.1

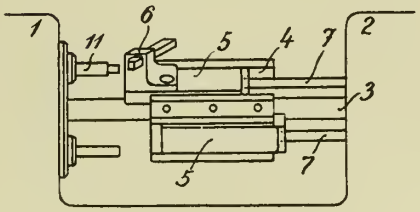


Fig.2

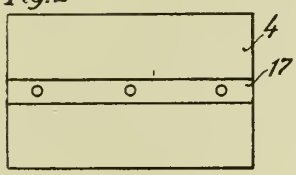


Fig.3

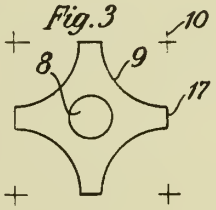


Fig.4

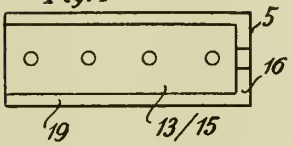


Fig.5

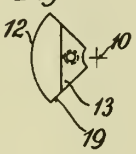


Fig.6

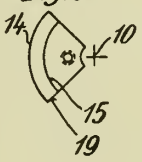


Fig.7

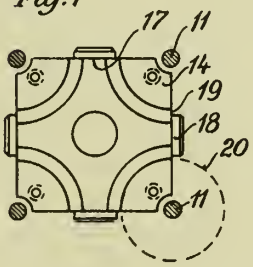


Fig.8

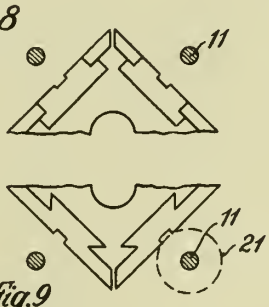


Fig.9

Inventor: Erwin Kohring,
by
Attorneys, Bryant & Lowry.

Published June 22, 1943 Serial No. 409,101

ALIEN PROPERTY CUSTODIAN

APPARATUS FOR CONTINUOUS FRACTIONAL DISTILLATION

Edwin M. F. Guignard, Berlin-Dahlem, Germany; vested in the Alien Property Custodian

Application filed August 30, 1941

This invention relates to apparatus for the continuous fractional distillation of liquids, more especially to apparatus of the type comprising a still and a rotatable helical vessel located in the still, the liquid to be distilled being conveyed through the helical vessel in one direction and then streaming backwards through the still in counter-current. One object of the invention is to separately withdraw the vapors developed in the helical vessel and in the still. Another object of the invention is to combine two or more of these apparatus so that more than two distillates can be withdrawn. A further object of the invention is to assemble one or more of such units including the heating means on a common truck so that the whole plant can be readily transported from one place to another.

The invention is illustrated, by way of example, in the annexed drawing, of which

Fig. 1 is a vertical longitudinal cross-section of a distilling apparatus constructed according to the invention;

Fig. 2 is a diagrammatical cross-sectional view showing two units including a burner arranged above one another on a common truck;

Fig. 3 is a vertical cross-section on the line III—III of Fig. 2.

In the still 1 a rotatable shaft 2 is journaled on which a cylinder 3 is mounted. A helical band or partition 4 of moderate width is attached to the inner wall of the cylinder 3. The liquid to be distilled is supplied by a pipe 16 conducted through an opening 7. It spreads on the bottom of the cylinder 3 and is conveyed by the rotation to the other end of this cylinder where its residue is raised by a horn-like pipe or vessel 5 to a point above the shaft 2. The inner end 6 of the horn 5 is open at its left side and pours the liquid into the cylinder 1. The vapors developed during the travel of the liquid through the cylinder 3 are withdrawn through a pipe 8 conducted through a central opening 7' in the front wall of the cylinder 3 and fixed in the front wall of the cylinder 1.

To obtain a tight joint between both ends of the cylinder 3 and the outer cylinder 1 sleeves 9 and 10 telescoping in each other are provided, of which the inner one 9 is fixed to the front walls of the still 1 whereas the outer one 10 is freely displaceable in horizontal direction and carries in an extension 11 a cast iron ring 13 pressed by springs 12 against the front walls of the cylinder 3. The outer ends of the sleeves 10 are kept by screw spindles 15 provided with hand-wheels 14. By turning these spindles the force with which the rings 13 are pressed against the front walls of the cylinder 3 may be adjusted.

At the left side of the figure the lower part of the outer sleeve 10 is extended to a trough 17 divided by a partition 18 whereby a liquid seal is formed allowing the liquid to flow over to the still 1 but preventing the escape of the vapors formed in the cylinders 3. Openings provided in both sleeves and coinciding regardless the displacement of the inner sleeve enable the liquid to enter the trough 17.

The vapors formed in the still 1 pass through openings 20, roofed by a cap 19, to the discharge pipe 21, the cap 19 being overflowed by the heating gases. The liquid flows from the left to the right in the lower part of the still 1 and leaves it through the pipe 22.

Figs. 2 and 3 show two stills arranged one above the other. Both stills are traversed by the liquid in the same way, except that the lower still is not fed with the raw material, but with the liquid leaving the upper still. 23, 24, 25, and 26 are four condensers from which in the case of raw tar to be distilled a light oil, a middle oil, a heavy oil and an anthracene oil may be withdrawn. In contradistinction to the scheme represented in the drawing, the condensers may be arranged to save place at the sides of the jacket 27 provided to envelop the stills with an insulating material such as asbestos wool.

The fire place is denoted by 28. By the fire the lower still is immediately heated, but the upper still may be exposed also to the immediate action of the combustion gases by means of a connecting tube 29. By baffle plates 30 the heating gases are directed in such a manner that the whole surface of the stills is met by them, as appears from Fig. 3, in which the heating flues are denoted by small circles including either a point or a cross, the point meaning an arrow directed toward the spectator, and the cross meaning an arrow in inverse direction. The heating gases at first flow along the still from front to back, then through the two lateral parts 31 from back to front, then through the upper part 32 from front to back, then along the lower part of the upper still from back to front, then through the lateral parts 33 from front to back, and finally along the upper part 34 of the upper still from back to front, and at last are discharged by the chimney 35.

Such distilling plant may be stationary or it may be mounted, as diagrammatically shown in Figs. 2 and 3, on a truck.

EDWIN M. F. GUIGNARD.

PUBLISHED

JUNE 22, 1943.

BY A. P. C.

E. M. F. GUIGNARD

APPARATUS FOR CONTINUOUS FRACTIONAL DISTILLATION

Filed Aug. 30, 1941

Serial No. 409,101

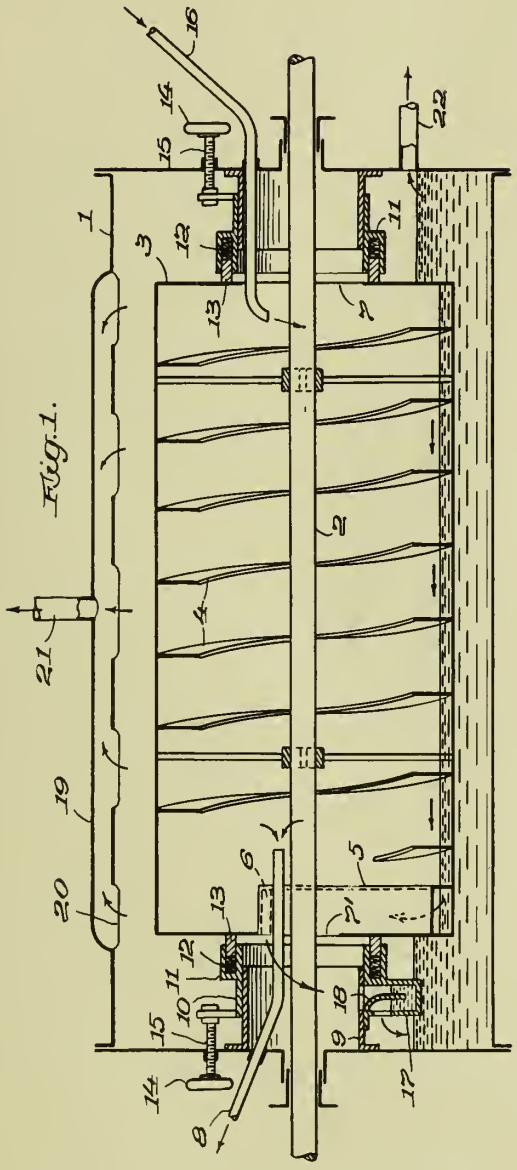


Fig. 1.

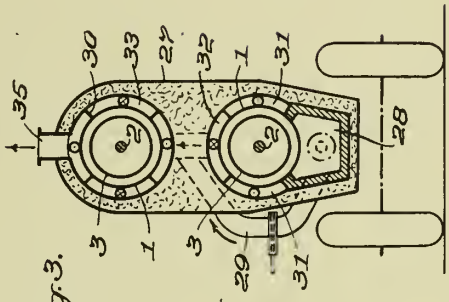


Fig. 3.

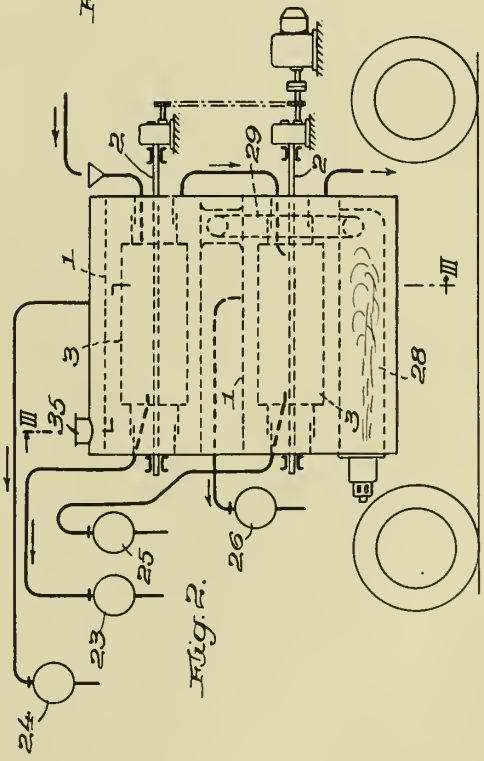


Fig. 2.

Inventor:

Edwin M. F. Guignard

Published June 22, 1943 Serial No. 416,053

ALIEN PROPERTY CUSTODIAN

WATER-SOLUBLE MOTH-PROOFING AGENTS

Heribert Schüssler, Cologne-Deutz, Germany; vested in the Alien Property Custodian

No Drawing. Application filed October 22, 1941

The present invention relates to water-soluble moth-proofing agents.

Hitherto water-soluble moth-proofing agents have been manufactured by introducing sulfo or carboxylic acid groups into the aromatic nucleus of compounds being effective but insoluble in water and having phenolic hydroxy groups. Another way was by using for the synthesis such starting materials as contain sulfo or carboxylic acid groups in an aromatic nucleus. Water-soluble moth-proofing agents of this kind, however, have the disadvantage that they are less effective when compared with the corresponding compounds bearing no sulfo or carboxylic acid groups, as by the introduction of such groups for rendering the moth-proofing agents water-soluble, their effectiveness is more or less diminished.

In accordance with the present invention it has been found that the aliphatic sulfocarboxylic acid esters of water-insoluble moth-proofing agents, which contain at least one free phenolic hydroxy group, represent valuable water-soluble moth-proofing agents. Obviously the same applies to the corresponding water-soluble salts of the aliphatic sulfocarboxylic acid esters as, for instance, the alkali metal salts. Therefor, the appended claims are intended to cover the free acid esters as well as their water-soluble salts. The great advantage of the aliphatic sulfocarboxylic acid esters consists in that the effectiveness is not diminished by the presence of the acid ester group. On the contrary in some cases the effectiveness is increased, whereas, when sulfonic or carboxylic acid groups are directly introduced into moth-proofing agents containing phenolic hydroxy groups, the effectiveness is more or less diminished. The new aliphatic sulfocarboxylic acid esters are distinguished by an excellent levelling capacity. They can be employed for rendering goods liable to the attack of moths with the same effectiveness from an acid as well as from a neutral bath. They are, therefor, especially suited for the treatment of mixed tissues consisting of wool and artificial silk, which in many cases are advantageously treated in a neutral bath. By this property they are superior to known moth-proofing agents, for instance those described in the U. S. Patent 1,707,181, which only in an acid bath show a sufficient affinity to the vegetable fiber.

The process for obtaining the new aliphatic sulfocarboxylic acid esters consists in acting with monohalides or anhydrides of aliphatic sulfocarboxylic acids in the presence of a tertiary base upon moth-proofing agents being insoluble in water, but containing at least one free phenolic hydroxy group. The reaction may be performed, for instance, as follows:

The calculated amount of the carboxylic acid sulfo chloride is dissolved in anhydrous pyridine, and in portions the calculated amount of the phenol is added. The reaction is finished after a treatment of one or two hours at an elevated temperature. The phenolic hydroxy groups are totally or partially esterified, that is—as it may be supposed—with the carboxylic acid group. As starting materials there come into consideration all kinds of water-insoluble moth-proofing agents containing at least one free phenolic hydroxy group as, for instance, naphthols, compounds derived from diphenyl, diphenylmethane, triphenylmethane, as for example:

1-methyl-3.6-dibromo-β-naphthol,
1.3.6. tribromo-2-naphthol,
2.4-dibromo-1-naphthol,
1-chloro-6-bromo-2-naphthol,
dibromo-1-chloro-2-naphthol,
6-bromo-1-methyl-2-naphthol,
2.2′-dihydroxy-3.3′.5-5′-tetrachloro-dihydroxy-diphenyl,
2.2′-dihydroxy-3.3′.5.5′-tetrabromo - dihydroxy-diphenyl,
4.4′-dihydroxy-3.3′-dichloro-diphenyl,
2.2′-dihydroxy - 3.3′-tetramethyl - diamido-5.5′-dichloro-diphenyl-methane,
2.2′-dihydroxy-5.5′-dichloro-diphenyl-methane,
2.2′-dihydroxy - 3.3′ - dimethyl-5.5′-dichloro-diphenyl-methane,
2.2′-dihydroxy-4.4′-dichloro-diphenyl-methane,
2.2′-dihydroxy - 3.3′-dimethyl - 4.4′-dichloro-diphenyl-methane,
2.2′-dihydroxy - 4.4′-dimethyl - 5.5′-dichloro-diphenyl-methane,
2.2′-dihydroxy - 3.3′.5.5′ - tetrachloro-diphenyl-methane,
2.2′.5.5′ - tetrachloro - 4.4′-dihydroxy-diphenyl-methane,
2.2′-dihydroxy-3.3′.5.5′.6.6′-hexachloro - diphenyl-methane,
2.2′-dihydroxy-5.5′-dichloro-triphenyl-methane,
2.2′-dihydroxy-5.5′.2′′-trichloro-triphenyl-methane,
2.2′-dihydroxy - 3.3′-trimethyl-5.5′.2′′-trichloro-triphenyl-methane,
2.2′-dihydroxy-5.5′.4′′-trichloro-triphenyl-methane,
2.2′-dihydroxy - 3.3′.5.5′.2′′.6′′ - hexachloro-triphenyl-methane,

2.2'-dihydroxy - 3.3'.5.5'.2''.4'' - hexachloro-triphenyl-methane,
2.2'-dihydroxy - 3.3'.5.5'.3''.4''-hexachloro - triphenyl-methane,
2.2'-dihydroxy-3.3'-dimethyl-5.5'.2''.4''.5''-pentachlorotriphenyl-methane,
2-hydroxy-3.5.3'.5'-tetrachloro-2'.2''-sulfone-triphenyl-methane,
2.2'.3''.trihydroxy - 3.3'.5.5'.2''.4''.6''-heptachloro-triphenyl-methane,
3.2'-dihydroxy-2.4.6.3'.5'-pentachloro - 4''-nitro-triphenyl-methane,
2-hydroxy-3.5.3'.5'.4''-pentachloro - 2'.—''-sulfone-triphenyl-methane,
3.2'-dihydroxy - 2.4-6-3'-5' - pentachloro-3''-nitro-triphenyl-methane,
2.2'-dihydroxy-3.3'.5.5'.4'' - pentachloro-triphenyl-methane,
2.2'.dihydroxy-3.3'.5.5'.2''-pentachloro - triphenyl-methane,
2.2'-dihydroxy-3.3'.5.5'.2''- pentachloro-6''-fluoro-triphenyl-methane,
2.2'-dihydroxy-3.3'.5.5'-tetrachloro- 2''.6''-difluoro-triphenyl-methane,
2.2'.dihydroxy-3.3'.5.5'.2''.4''.5''.heptachloro-triphenyl-methane.

As sulfocarboxylic acids, the halides of which, their anhydrides respectively, may be employed, may be mentioned, for instance sulfoacetic acid, β-sulfopropionic acid, sulfo-iso-caproic acid as well as their substitution products.

My new compounds may be employed in the usual manner in aqueous solution at an elevated temperature and, if desired, in the presence of acids, as stated above.

The present application is a continuation in part of my copending application Ser. No. 268,533, filed April 18, 1939.

The following example illustrates the invention without, however, restricting it thereto, the parts being by weight:

Example 1

35 parts of sulfoacetic acid chloride are dissolved in 100 parts of anhydrous pyridine and to this solution 52 parts of 2.2'-dihydroxy-3.3'.5.5'.-2''.4''.5''-heptachlorotriphenylmethane are subsequently added with stirring. The reaction is finished after a stirring of one or two hours at a temperature of about 90°. On diluting with water and acidifying the ester, its disodium salt respectively separates by salting out with sodium chloride.

By treating woolen tissue for instance with 1% of the ester thus obtained (calculated on the weight of the material to be proofed) according to the dyeing process with the addition of acetic acid and sulfuric acid for one hour at boiling temperature, the tissue is really protected to the attack of moths.

The same protective effect is obtained by treating mixed fabrics, consisting of wool and viscose stable fiber, with 1% (calculated on the weight of the material to be proofed) of the above compounds in a neutral bath with the addition of 10% of Glauber's salt for one hour at a temperature of 95°.

Instead of 2.2'-dihydroxy-3.3'.5.5'.2''.4''.5''-heptachlorotriphenylmethane may be employed 2.2'-dihydroxy- 3.3'.5.5'.4''- pentachlorotriphenylmethane or 2.2'-dihydroxy-3.3'.5.5'.2''.4''-hexachloro-triphenyl-methane, 2.2'-dihydroxy-3.3'.-5.5'.2''.4''-hexachloro - triphenyl-methane, 2.2'-dihydroxy - 3.3'.5.5'.3''.4'' - hexachloro-triphenyl-methane.

HERIBERT SCHÜSSLER

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ALIEN PROPERTY CUSTODIAN

MOTION PICTURE PROJECTORS

Erno Bolcskey, Budapest, Hungary; vested in the Alien Property Custodian

Application filed November 28, 1941

My invention relates to improvements in or relating to motion picture projectors, particularly narrow picture projectors and sound projectors.

The invention aims particularly improvements in the guidance and feeding of the film strip.

In the case of the known projectors the device for the reproduction of the sound was perfectly independent from the projectors. The films was first moved through the picture projector and then through the device for the reproduction of the sound. The latter was equipped not only with a separate drawing drum but beside this with at least two, in many cases with several tension, damping and leading drums. Such means had to be used in order to transform the step-by-step movement of the film caused by the fork or any other film conveying means, into a continuous movement. Such contrivances, however, have on the one hand the drawback that they comprise a multiplicity of parts and on the other hand, the film strip could not be moved continuously on the sound track drum even in the case that the movements of the drawing drum were perfectly continuous. This was due to the fact that the movement of the film through the projector was not effected by the sound track drum comprising the photoelectric cell but by a drawing drum arranged behind the sound track drum.

By the invention these drawbacks are completely eliminated in such a manner that the sound will be reproduced with the smallest possible number of elements and the utmost continuity. To realise this, the sound track drum itself is driven. This drive is effectuated completely continuously by moving the sound track drum by means of a flywheel and an elastic coupling. In new projectors, the sound track drum constructed in compliance with the invention may replace from the beginning the drawing drum of the picture projector and may be arranged following the aperture and the means for effecting the intermittent movement of the film. In the case of a combination with a silent motion picture projector, the sound track drum may be disposed behind the picture projector without any particular change in the construction. The apparatus, however, can be applied also by itself for sound reproduction. A further advantage of the apparatus according to the invention consists in that it may be used for films with rightsided perforation as well as for leftsided ones, since the rotating direction of the sound track drum may be inverted by way of a simple transmission gear. By inserting the sound strip in the opposite direction it can be effected that also films being perforated on the opposite side can be turned towards the lense system with their emulsion side. Narrow films as usually applied, are perforated on their right as well as on their left side. In the known sound reproduction apparatusses this reversion could not be effected at all or only by using elaborate changes, as the film did not move symmetrically to the photoelectric cell.

The known apparatusses for sound reproduction have the further drawback of impairing the uniformity of the sound substantially by the circumstance that the film strip bearing on one of its edges the sound track did not lay up uniformly on the sound track drum and that consequently that part of the film bearing the sound track but not supported by the sound track drum got twisted in wavy lines or was, at least, positioned in a non-uniform distance from the photoelectric cell. In the known projectors it has been tried to avoid this drawback by disposing a pressing roller which had the purpose of pressing the film to the sound track drum and by this to compensate the lack in uniformity. Such means proved, however, not satisfactory as, on the one hand, the pressing roller could not be placed near enough to the photoelectric cell owing to constructional reasons, whereas on the other hand, as the emulsion side of the film lays on the drum, the pressing roller can work only on a very small surface between the picture and the sound track. If a roller having a broader surface had been employed, the emulsion on the picture film would have been destroyed.

The above cited drawbacks are eliminated by the invention in such a manner that the sound track drum is formed slightly conically, e. g. with a conicity of 1:100, growing in width from the perforated part towards the sound track. In this way the film lays upon the sound track drum mainly in the vicinity of the sound track, so that the sound track will pass by the photoelectric cell in a shape corresponding exactly to the sound track drum and in a constantly equal distance.

The invention relates finally to an improvement in the conveying fork operating the intermittent movement of the film, which engages the perforations disposed on the edge of the same to the purpose of advancing the film strip.

The known conveying forks are usually carried out with two teeth. According to the invention the conveying fork comprises on the same plane more than two, advantageously four teeth. By

this execution of the fork the following advantages are obtained:

1. The perforations of the film will be worn out more uniformly in consequence of the distributed strain.

2. The movement of the film will be more uniform than hitherto.

3. Even film strips being used for a long time, the perforations of which are damaged, can be moved along well.

In Fig. 1 of the drawing, 10 represents a film-drum rotating around the shaft 11 from which the film 12 runs. This film is equipped on one of its edges with perforations 13, in which the conveying fork as hereinafter described engages. A swinging arm 15 is mounted on the housing 14, on the free end of which a roller 16 is mounted rotatably. In a certain distance from this arm 15 there is a second swinging arm 15' mounted on the housing 14, which carries on its free end a roller 16' similar to the roller 16. Between the rollers 16 and 16' a third roller 17 is mounted which is equipped on its edge with sprockets 18, which engage the perforations 13 of the film 12. The film advances between the rollers 16 and 17 respectively 17' and 16' as indicated in the figure and then runs downward through a vertical guide channel 19. This channel is mounted on the housing 20 and comprises a slot in which the conveying fork 21 operated in the known manner moves upwards and downwards, during which movements engaging the perforations 13 of the film 12 by its teeth 22, by this causing the film to move up- and downwards from the projector lense 23. Arm 24 serves in a well known manner for focussing the lense system of the mechanism. The film is now carried around a drum 25 serving as sound track, which is equipped with sprockets 26 for engaging the perforations 13. This drum is to be described more particularly hereinafter. Two pressure rollers 27 and 27' pressing the film to the drum may be both swung by way of the handles 27*a* and 27*b*, Figures 1 and 4. The film 12 moves first between the drum 25 and the roller 27' then runs around the drum 25 and finally advances between drum 25 and roller 27. Now it reaches the roller 28 which is similar to the roller 17 and provided with sprockets 29 at its edge. Beside the roller 28 there are the roller 30 and 30', which are mounted similarly to the roller 16 and 16' on the rotatable arms 31 and 31'. From the roller 30 the film runs to the film drum 32, the shaft 33 of which is carried by arm 34 mounted on the casing of the apparatus.

While the film is carried around the drum 25, it arrives into the scope of the lense system 36 alighted by the source of light 35 for the sound reproduction. The lense system is carried out in a manner known per se. The housing 36 of the lense system comprises a ventilation opening 37.

The lamp for the picture projection is mounted in a manner known per se in the housing 39, carrying the housing 20 mentioned above and is equipped at its upper part with a ventilation opening 39.

The whole device is mounted on a socket 40 which comprises the switches 41, 42 and 43 for the projector lamp, the driving motor and the lamp 35.

Figure 2 shows the housing 14 seen from behind and shows the drive of the apparatus.

A vertical shaft 46 is rotatably mounted in the projections 44 and 45 of the housing 14. On this a worm wheel 47 is keyd which is driven by a driving motor not shown in the drawing in a manner known per se, by means of a transmission gear. The principal shaft 46 is equipped with worms 48 and 49, which engage worm wheels 50 and 51. The shaft 52 of the wheel 50 supports the conveying roll 17 and the shaft 53 of the wheel 51 supports the conveying roll 28. Thus, when the motor rotates shaft 46 by means of the worm wheel 47, the rollers 17 and 38 rotate too and the film begins to advance.

There is also a pulley 54 mounted on the shaft 53, which rotates the winding drum 32 by way of a string 55 in a manner known per se.

Figures 3 and 4 show the construction and drive of the sound drum.

The drum is formed out as a solid body comprising a sleeve-shaped projection 25', Figure 4. The sleeve 25' is mounted loosely on a suitable projection 56 on a solid part 57 of the housing 14, so that the sleeve 25' with the drum 25 can rotate freely with regard to the parts 56, 57 of the housing. The drum 25, 25' is mounted on a suitably bedded shaft 58. The photoelectric cell 59 is established in a recess of the housing 57 and projects into a suitable recess 61 of the drum 25, 25'.

According to the invention the surface of the sleeve 25' is formed slightly conically, Figures 4 and 5, so that the film 12 is pressed sufficiently by the rollers 27 and 27' on to the sleeve 25' forming the guide of the sound track, particularly with its parts 2^b supporting the sound track. The picture track of the film is indicated at Figure 5 by 2^a.

According to the invention the drive of the sound track drum is operated in the following way:

A flywheel 62 is keyed on the shaft 60 of the drum, Figure 2–4, which is coupled with a wheel e. g. with a worm wheel 64 arranged loosely on the shaft 60, by means of springs 63. The wheel 64 is rotated by a worm 65 of the principal shaft 46, Figure 2. The springs 63 are mounted on the one hand on bolts 66 fixed in the flywheel 62 and on the other hand on bolts 67 fixed in the wheel 64. In the drawing three bolts 66 and 67 and a corresponding number of springs 63 are shown.

The wheel 64 may also be driven by a separate motor.

The fork 21 advances the film 12 in a known manner intermittently along the picture projector 23. This intermittent movement must be transformed at the sound track 25, 25' into a continuous movement which succeeds by the above described drive of the drum 25, 25' in a simple manner.

Figure 6 shows an advantageous way of execution of the conveying fork 21.

According to the invention the fork comprises, unlike the known construction in Figure 7, not two but more, preferably four conveying teeth 22, which engage the perforations 13 of the film in a manner known per se. The teeth 22 are arranged at equal distances which correspond exactly to the distances of the perforations 13 of the film. As in new films the perforations are provided at perfectly equal distances, the edges of the perforations are worn uniformly by the teeth 22 during the advancing of the film. After a certain time of wear, however, the edges of the film become damaged. If the film is moved by a known fork 21, comprising only two teeth, the film will advance non-uniformly. Besides, the undamaged holes will also be soon torn in at their edges. Now, if two adjacent holes were

damaged, the known conveying fork was unable to push forward the film at all. It had to be waited, until the drawing drum drew the film on. In consequence thereof, the film often tore or the picture was moved intermittently.

When the conveying fork comprises, according to the present invention, more than two, e. g. four teeth **22**, the film will always be moved on uniformly and continuously, even if a part of the holes are damaged at their edges. An interruption of the conveying of the film and the tearing of the film is thus avoided.

ERNO BOLCSKEY.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

E. BOLCSKEY
MOTION PICTURE PROJECTORS
Filed Nov. 28, 1941

Serial No.
420,886
2 Sheets-Sheet 1

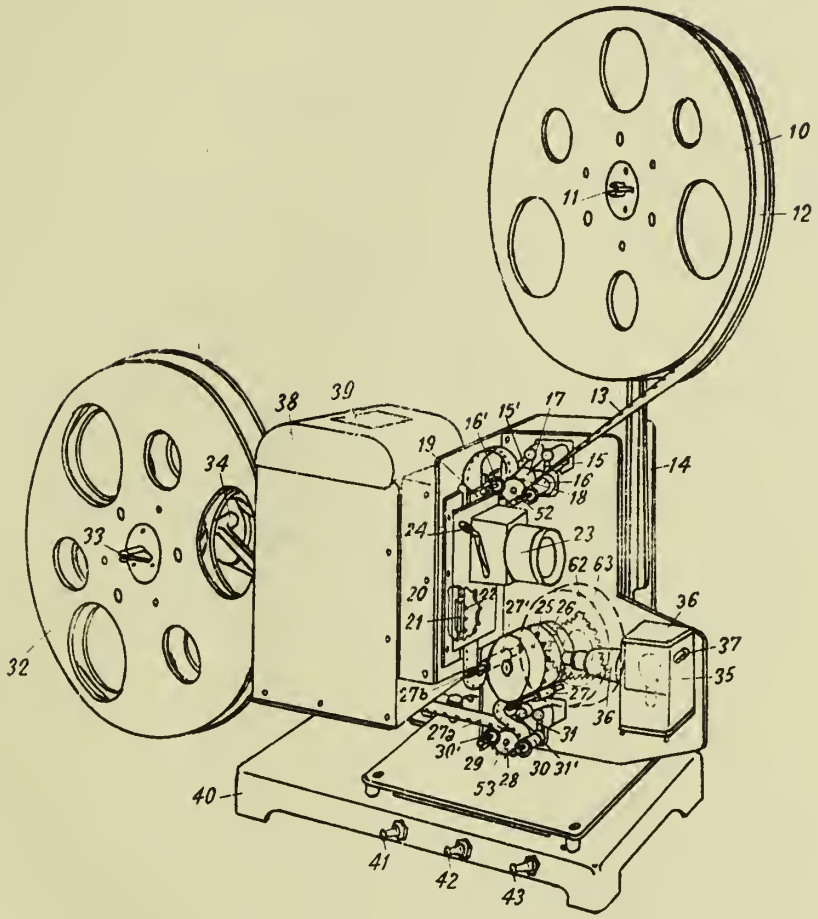

Fig. 1.

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BY A. P. C.

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MOTION PICTURE PROJECTORS

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2 Sheets-Sheet 2

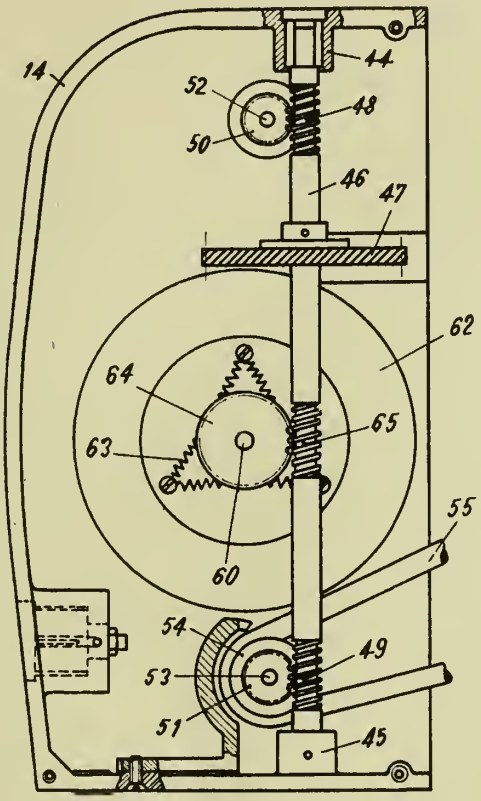


Fig. 2.

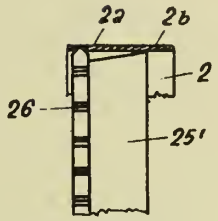


Fig. 5.

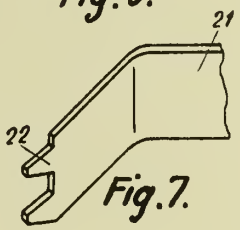


Fig. 7.

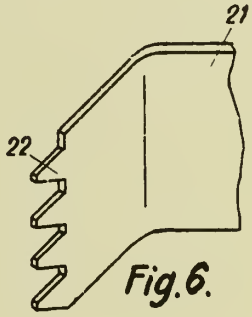


Fig. 6.

Fig. 3.

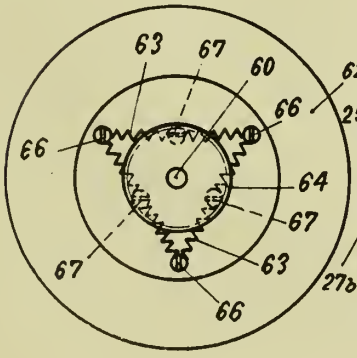
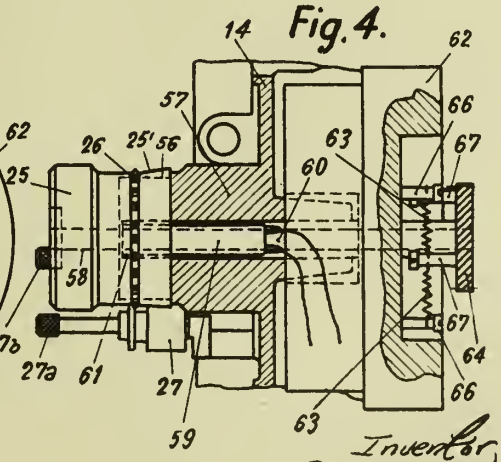


Fig. 4.



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By: Glascock Downing & Seibold
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Published June 22, 1943 Serial No. 436,280

ALIEN PROPERTY CUSTODIAN

ELECTRIC APPARATUS SIMULTANEOUSLY PRODUCING DISSOCIATION OF WATER INTO HYDROGEN AND OXYGEN, FIXATION OF OXYGEN AND THE UTILIZATION OF HYDROGEN AS COMBUSTIBLE

Jacques Couëlle and Dimitri Costin, Marseilles, France; vested in the Alien Property Custodian

Application filed March 26, 1942

Based on the same principle of dissociation of water and fixation of oxygen gas by carbonic gas, as described in the French Patent letter of Messrs. Jacques Couelle and Dimitri Costen, taken 11th March 1941, the object of the present invention consists in an apparatus which is electric simultaneously producing the same operations and having the purpose to obtain and separate particularly the hydrogen gas of the oxygen which afterwards will be used as combustible for industrial and home heating.

This apparatus is represented on the annexed rather schematical sketches, added in order to explain and also to furnish an example of execution of one of the shades of the object of the invention.

As to the sketch:

Figure 1 shows the total of the electric apparatus producing simultaneously dissociation of water in order to obtain hydrogen and oxygen, seen in elevation and length-cut following the line I, I of Figure 2.

Figure 2 shows the same apparatus seen in plane and in transversal cut following the line II, II, of the Figure 1.

In the shown example the apparatus is composed by two cylindrical bodies 1 and 2 concentrically disposed.

The cylinder 1 includes heating plates 3, 3*a*, in preference of pure nickel or platinum. These plates are isolated from each other by targets 4, of isolating material known, for instance mica. These plates can resist a temperature of 1500° which will be communicated to same bypassing an electric current entering at conductor 5 in the centre of the cylindrical body 1 and getting out at its periphery. This current may vary in intensity by application of a rehostate.

These plates 3 and 3*a* are superposed thus that they form successive diffusers; these plates dissociate the water arriving by pipe 6, and will be projected in the body 1.

In the inferior part of body 1 is also a diffuser 7, representing the particularity of being perforated by a large number of holes like a strainer, and whose interior is furnished with foam of platinum 8.

The oxygen and hydrogen gas, which have been obtained by dissociation of water after the known principles, receive in quantities as necessary oxygen of carbon, after having traversed the diffuser, spoken of last; this principle is a new one; the oxygen of carbon comes by pipe 9 and serves to neutralize the oxygen to be. The thus separated gases pass a filter 10 containing active coal which simultaneously realizes the absorption of oxygen and the cleaning of hydrogen. However it is possible that there residue still some rests of oxygen in the hydrogen gas, same will be completely neutralized by having passed them in the separator 11 constituted by electrodes 12 whose current is sent in them by very short interruptions in using an apparatus 13 with trembler, known system, as employed on the coils of induction by Ruhmkoff.

Now the hydrogen gas is completely separated from the oxygen and by pipe 14 is ready for utilization to nourrish all systems of burners in order to be used for domestic heatings.

This apparatus also is furnished with an orifice 15 with a perced gaze on the cover 16. This orifice allows to control the degree of the heating of the apparatus.

This apparatus can be constructed in different shades and sizes, and also its dispositions may be varied, always without changing the general disposition of the invention which has been abovedescribed, nor its industrial result which is new and which is to realize by electricity the dissociation of water with the precis end to use out of it only the hydrogen gas for all heating and all applications after having eliminated the oxygen gas.

Recapitulation

Electric apparatus simultaneously producing dissociation of water into hydrogen and oxygen, fixation of oxygen and the utilization of hydrogen as combustible, characterized by:

1. Two bodies of similar shade concentrically disposed the one in the one in the other.

The interior body containing heating plates by passage of an electric current.

2. A diffuser containing foam of platinum placed on the low part of the interior body as above mentioned.

3. An arrival of oxyde of carbon placed in the low part and in the interior of the exterior body.

4. A filter containing active coal, this filter surrounding the inferior and exterior part of the interior body, as mentioned in the first paragraph.

5. A separator with electrodes electric, also surrounding the exterior part of the interior body mentioned in first paragraph.

6. Distributions of electric current on the one hand, constant for the dissociation of the separation of gas and the absorption of the gas oxygen.

JACQUES COUËLLE.
D. COSTIN.

PUBLISHED
JUNE 22, 1943.
BY A. P. C.

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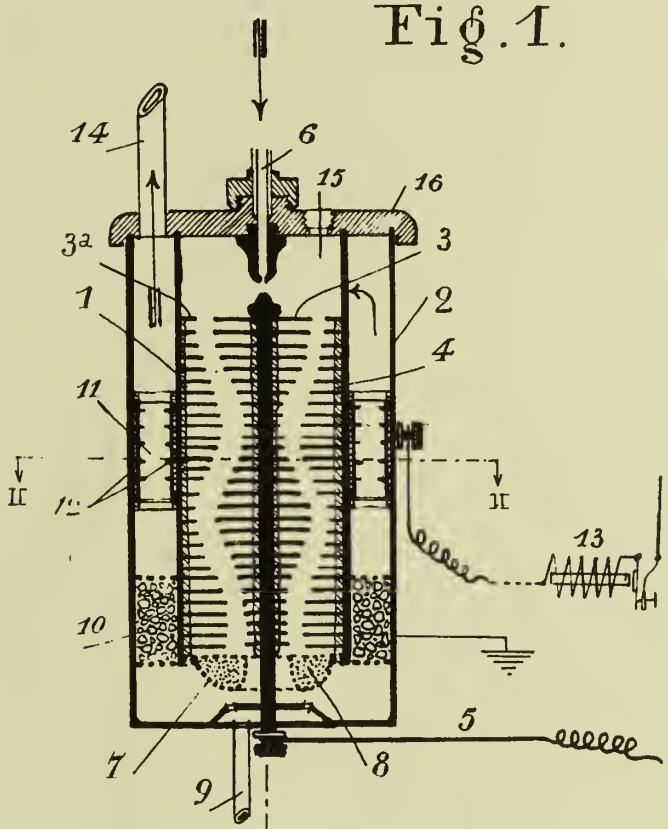
ELECTRIC APPARATUS SIMULTANEOUSLY PRODUCING DISSOCIATION OF WATER INTO HYDROGEN AND OXYGEN, FIXATION OF OXYGEN AND THE UTILIZATION OF HYDROGEN AS COMBUSTIBLE

Filed March 26, 1942

Serial No. 436,280

Fig. 1.



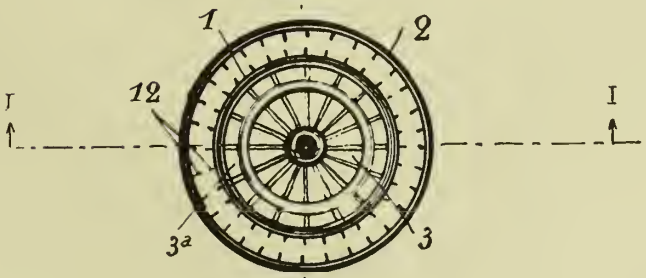


Fig. 2.

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ALIEN PROPERTY CUSTODIAN

IGNITION SYSTEMS FOR MULTI-CYLINDER ENGINES

Jean Bernard, La Jasse, par Saint Hilaire de Brethmas, France; vested in the Alien Property Custodian

Application filed May 21, 1942

The present application forms a continuation-in-part application of my co-pending application Serial No. 202,571, filed April 15, 1938.

My invention relates to the ignition systems for multi-cyclinder engines, such for instance as the present engines with 12, 14, 18 cylinders and so on, in star, V, W, and in a general manner for all engines in which the axes of the cylinders are located in one or a plurality of planes perpendicular to the axes of the crankshaft and are arranged in each plane, along the radii of a circle, and the corresponding pistons of which are connected to the crankshaft through the medium of a master connecting rod and of secondary connecting rods pivoted thereto.

In the engines in question, the passage over the dead centre of a piston in a cylinder other than that of the master connecting rod does not correspond to the passage of the crankshaft pin on the geometrical axis of the cylinder owing to the slant of the secondary connecting rods and takes place either before or after which corresponds on the circular diagram to an angular displacement between the radius representing the geometrical axis of the cylinder and the radius representing the dead centre of the piston.

The object of my invention is to obtain a satisfactory ignition in such an engine and to initiate combustion at the same period of the cycle in each cylinder.

A further object of my invention is to provide interrupting means for controlling the timing of the ignition sparks in said non symmetrical intervals so that the angular spacing between two interruptions corresponds to the irregular angular spacing between the radii representing the dead centres of the pistons.

A still further object of my invention is to provide a compensated rotating interrupting cam in which the bosses corresponding to the various cylinders instead of being equally spaced according to the constant angular spacing between the geometrical axes of the cylinders, are irregularly distributed to compensate the irregularities of the connecting rods; in other words in which the space of time which separates the action of a boss from the action of the boss preceding it corresponds to different angles of rotation of the cam according to the pair of bosses considered.

The flow of ignition current such initiated is distributed by means of a distributing arm for instance which generally is rigidly secured for rotation to the said cam.

In order to facilitate the comprehension of my invention the accompanying drawing shows interrupting means together with a diagram.

As well known, the interrupting means of an ignition magneto includes a cam **6** which cooperates with at least one breaker arm **7**. The said breaker arm **7** is provided with a contact **8** which engages with a stationary contact **9**. The arm **7** and the stationary contact **9** are connected to the terminals of the primary windings of an ignition coil **10**, the secondary winding of which is connected to the various cylinders through a distributor the arm of which rotates with the cam.

In the present instance, the interrupting means are designed to cooperate with a fourteen cylinder star engine, the shafting of which is of the usual type including a master connecting rod directly connecting the crankshaft to one piston and six secondary connecting rods pivoted to said master connecting rod. The secondary connecting rods respectively connect the other pistons to said master connecting rod. The cam **6** is rotated in the direction of the arrow *f* by the said crankshaft to be driven thereby at half the speed of the engine.

It is a known fact that with such a shafting the crankshaft must rotate through successive various angles to successively bring to various pistons to their successive dead centre positions.

The radii OA, OB, OC, OD, OE . . shown in full lines the geometrical axes of the cylinders taken in their order of ignition and the radii O**1**, O**2**, O**3**, O**4**, O**5** . . the positions in which the various pistons pass the dead centre for which positions the ignition sparks should successively occur in the various cylinders if account is not taken of the advance of the sparks. For that purpose, the cam **6** is provided with the bosses **11**, **12**, **13**, **14** . . the engaging faces **11'**, **12'**, **13'**, **14'** of said bosses with the breaker arm **7** (in the direction of the arrow *f*) are respectively arranged according to the radii O**1**, O**2**, O**3**, O**4**, O**5** . ., to interrupt the circuit of the coil **10** and thereby to initiate the combustion in the same period of the cycle in each cyclinder.

The radius OA represents the piston directly connected to the crankshaft through the master connecting rod and the radius O**1** consequently coincides with OA. For the other cylinders which correspond to the secondary connecting rods, the radii O**2**, O**3**, . . O**5** are located either in front of the radii OB, OC, . . or behind. In the present instance the geometrical angular spacing between the cylinder axes is constant and substantially equal to 25°43', the crankshaft must rotate through the following different angles when starting from the cylinder **1** to successively bring the various pistons to their dead point positions illustrated by the radii O**2**, O**3**, O**4**, O**5**: 52°20', 54°32', 50°, 46°16', 50°, 54°32', and so on. There is thus a forward relative displacement of 54' of the dead centre position in cylinder **2**, a forward relative displacement of 4° in cylinder **3**, and so on.

The positions of the engaging faces **11'**, **12'** . . . of the bosses of the cam, which controls the timing of the ignition sparks are thus determined.

JEAN BERNARD.

PUBLISHED

JUNE 22, 1943.

BY A. P. C.

J. BERNARD

IGNITION SYSTEMS FOR MULTI-CYLINDER ENGINES

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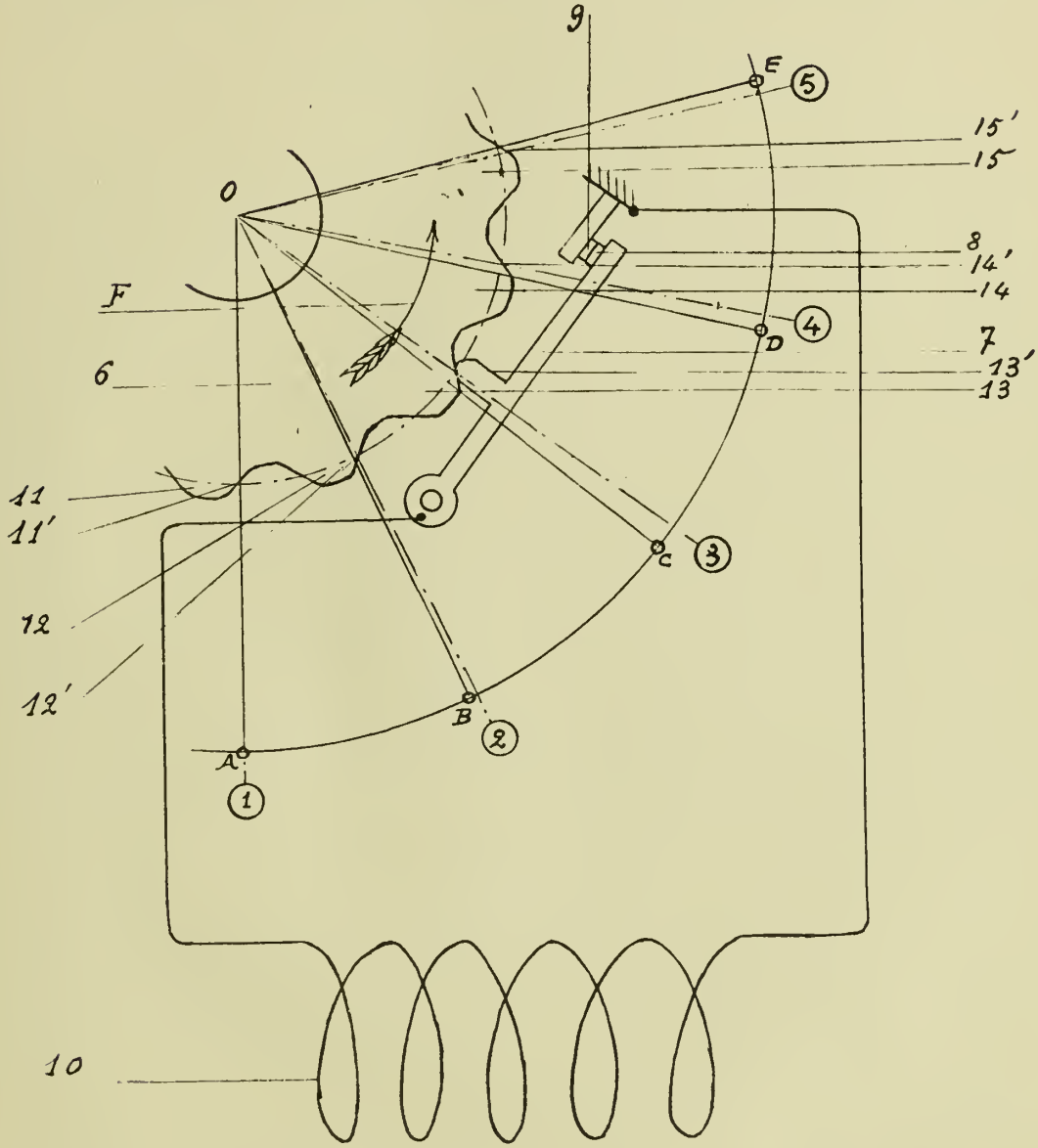
Serial No. 443,988



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Published June 22, 1943 Serial No. 444,238

ALIEN PROPERTY CUSTODIAN

ELECTRODE FRAME STRUCTURES

Georg Hagerup-Larssen, New York, N. Y.; vested in the Alien Property Custodian

Application filed May 23, 1942

This invention relates to an improvement employed in connection with the Soederberg continuous electrode system, and is particularly intended for use with electrodes of non-cylindrical shape. For example, oblong electrodes of great size are now being employed in connection with the production of aluminum.

In the operation of this system, the raw electrode paste is introduced into the upper part of a casing and moves downwardly toward the furnace. As it approaches the furnace it becomes partly hardened by the heat of the furnace and is given final and additional hardening by passing some of the electric current through it before it is called upon to carry a full load.

Working with non-cylindrical electrodes, it has been found that the electrode paste is sufficiently fluid so that it exerts a substantial hydrostatic pressure tending to distort the casing which encloses the electrode. In some instances this casing may be a movable one which travels with the electrode material and in others it may be a fixed outside casing. If desired, both a movable and a fixed casing may be employed simultaneously. It has heretofore been suggested that the distortion of the electrode be prevented by the use of rigid bars arranged around the exterior of the electrode casing to hold it in place.

I have now discovered that there is a substantial zone through which the electrode moves where the electrode material is exerting hydrostatic pressure tending to distort the casing and still has the ability to recoalesce into a unitary structure if temporarily separated. Based on this discovery, I have found that the electrode casing can be very simply and efficiently reinforced by the use of internal rods or plates. The electrode paste moves around such reinforcements and coalesces below them to reform a unitary structure.

There is one difficulty with this problem. It is highly essential that the cross braces should not extend so far down in the electrode material that they reach the zone where baking has progressed to the point where the paste will not reunite. It has been found that the hardened zone of the electrode extends considerably higher near the middle of the electrode than at the edges. Thus if a straight rod or bar is used for cross bracing, it must be high enough up so that the central portion of the electrode where it has begun to be baked will still be below the cross brace. This means that at the sides a zone of fluidity will extend a substantial distance below the cross braces and may result in distortion.

I have found that this problem can be overcome by using flat plates for the cross braces, and by studying the characteristics of each individual furnace, the line of safety can be determined for the bottom edge of such a plate. This bottom edge will be shaped to follow the approximate line of hardening and of course should be positioned an appreciable distance above the line of hardening in order to insure that the paste will reunite. By making the plates of this shape to follow the contour of the baked portion of the electrode, the reinforcement can be carried down sufficiently far on the sides to maintain the casing in shape without having the reinforcement extend into the baked zone near the center.

While the cross braces may be made of steel, I have found that the electrode paste will slide very easily past faces of smooth aluminum. Instead of making the cross braces of solid aluminum, it is advantageous to make these of steel with removable aluminum plates.

It sometimes happens that operation of the furnace is stopped and the electrode hardens around the cross braces sufficiently so that its flow or movement will be stopped. If the faces of the braces are formed of separable aluminum plates, they may be released from the cross braces and allowed to go on down into the furnace and new face plates substituted. Since these plates are made of aluminum, they will not have any injurious effect on the metallic bath in the furnace.

It is obvious that if bracing between the sides of the fixed casing is employed and a movable casing is also used, the movable casing will have to be slitted or subdivided into sections so that it can move past the fixed braces.

It is also possible to provide cross bracing between the sides of the movable casing but in such case the cross bracing should be in the form of rods or relatively narrow plates so that no line of cleavage in the baked portion of the electrode will occur.

The invention may readily be understood by reference to the accompanying drawings in which Fig. 1 shows a sectional view through a furnace and electrode embodying my invention. For the purpose of simplicity the electric connectors for the electrode and the supports for the fixed casing are not shown. Fig. 2 shows a detailed sectional view on line 2—2 of Fig. 2 illustrating a manner in which releasable aluminum plates may be attached to the braces.

In these drawings 10 indicates the furnace and

12 is the fixed casing through which the electrode moves, which we may presume is of oblong shape. The broken line 14 indicates the approximate level to which the casing is filled with the electrode paste and the broken line 16 illustrates the curve of the top of the hard-baked part of the electrode. 18 is the metal plate serving as a cross brace, attached to the sides of the casing 12.

As shown in Fig. 2, the cross brace 18 extends above the normal level of the electrode mass which is indicated by the line 14. In this case the lower edge of the brace 18 is streamlined as indicated at 20 and the faces of the brace 18 are covered with thin sheets of aluminum indicated by the numeral 22. These may be held in place on the brace 18 in any desired manner as by the nut and bolt 24 which is positioned above the line 14 so that they may readily be released simply by removing this bolt.

While this is a preferred form of my invention, it is to be understood that it will have to be modified to suit the particular conditions that arise in connection with various types of furnace. Also while I have described this invention as principally used with aluminum furnaces, it may of course be used in any case where non-cylindrical continuous electrodes are employed.

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ELECTRODE FRAME STRUCTURES

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Fig. 1

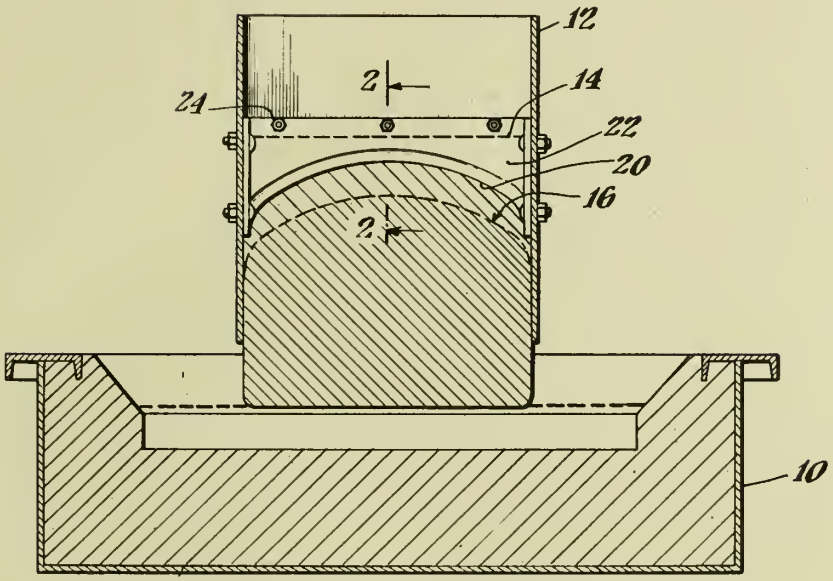
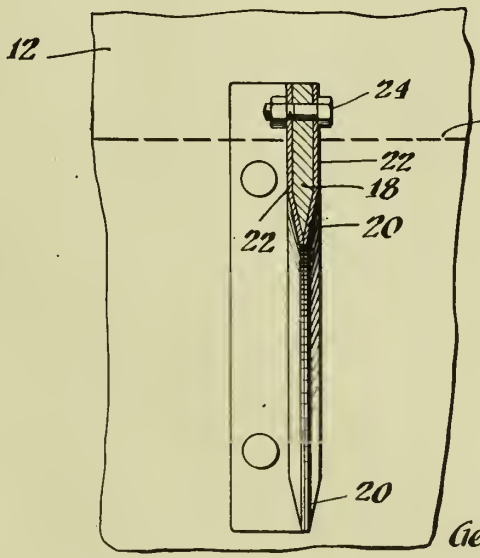


Fig. 2



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Published June 22, 1943 Serial No. 457,509

ALIEN PROPERTY CUSTODIAN

SURGICAL TABLES

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Application filed September 5, 1942

My invention relates to adjustable tables such as those for surgical purposes, those used as drawing boards, etc. and it refers more particularly to tables for surgeons operating with the aid of X-rays.

My invention has for its object to provide a table of the kind above-referred to which will be more easily adjustable and thus more convenient in use than the known tables.

In the annexed drawings:

Fig. 1 is a perspective view with parts in section showing a table constructed in accordance with my invention.

Figs. 2 and 3 are side and end views thereof, some parts being shown in section in Fig. 3, the plane of section being indicated at III—III in Fig. 2.

Figs. 4 and 5 are also side and end views with parts in section, showing the table at another position of the parts.

Fig. 6 is a diagram illustrating the movement of the main parts when the table is oscillated about its transverse axis.

Figs. 7, 8 and 9 refer to the electrical equipment of the table which is shown in end view, plan view and partial view to an enlarged scale, respectively.

Fig. 10 is a perspective view showing a lateral abutment.

Fig. 11 shows the stretcher, the "arching device" and the shafts which may be associated therewith.

Figs. 12 and 13 are respectively a perspective view and a plan view of an X-ray bulb support adapted to be associated with the table.

The table shown in the drawings comprises a base 1 supported by means of castor wheels, the said base being provided with a telescopic column 2 associated with a gearing to operate same in order to vary its height.

The table proper 3 is supported by column 2 through a mechanism adapted to permit its adjustment about a transverse axis, such mechanism comprising a pair of horizontal racks 4*d* and 4*g* fixed to side members 5*d* and 5*g* connected by a transverse member 5, and a pair of toothed sectors 6*d* and 6*g* cooperating with said racks. Members 5, 5*d* and 5*g* form a rigid structure fixed to column 2, while sectors 6*d* and 6*g* are rigidly carried by the longitudinal members 7*d* and 7*g* of a frame 7 which carries the table proper 3, as it will be explained below.

Carriages 8*d* and 8*g* are adapted to slide longitudinally along the upper part of side members 5*d* and 5*g* and they are actuated by a pair of longitudinal screws 9*d* and 9*g* horizontally and pivotally carried by the end portions 5*t* and 5*p* of members 5*d* and 5*g*. They are provided with trunnions on which sectors 6*d* and 6*g* are pivoted.

Fig. 6 clearly demonstrates the operation of the gearing described.

When screws 9*d* and 9*g* are actuated in unison (which is obtained by any appropriate means, such as chains and sprockets) carriages 8*d* and 8*g* are moved longitudinally and sectors 6*d* and 6*g* are oscillated together with frame 7 to which they are rigidly fixed. The assembly comprising the X-ray bulb and associated parts, carried by frame 7, thus assumes positions such as shown at 10A, 10B and 10C and is tangent to a cylindrical geometrical surface XY, the section of which is a cyloid. It will easily be grasped that this is an advantage with respect to the mere pivoting of frame 7 about a fixed transverse axis, as in the known constructions; more particularly my invention provides ample space for the X-ray bulb for any position of the table and avoids any risk of breakage of the same against the supporting column 2.

Frame 7 supports two columns 11*t* and 11*p* respectively fixed to its rear and front transverse members 7*t* and 7*p*, said columns pivotally carrying the rear and front transverse members 3*t* and 3*p* of the frame 3 forming the table proper. Two rods 12*t* and 12*p* are articulated at their upper ends to one of the ends of members 3*t* and 3*p* while their lower ends are pivotally connected with carriages 13*t* and 13*p* forming nuts on transverse screws 14*t* and 14*p* respectively. It will be understood that by operating screws 14*t* and 14*p* in unison by appropriate means, table 3 may be pivoted at will about a longitudinal axis.

As shown in Figs. 7 to 9, column 2 may be operated by an electric motor 15 housed within base 1, this motor being electrically connected through a plug 15^0 (Fig. 3) with a pair of pedals 15^1 and 15^2 (Fig. 1) disposed on a separate base or switchboard 16 and corresponding to upward and downward movement of column 2. There is also provided a switch with an operating head 15^{10} connected by a chain 15^{20} with member 5 and adapted to be actuated when the table reaches respectively its lowermost and its uppermost positions to cause stoppage of motor 15 while permitting its rotation in the reverse direction.

The mechanical connection between motor 15 and column 2 comprises a clutch 2^0 and a shaft with a square end 15^{00} projecting from the gear case and adapted to receive an actuating handle, in order to permit hand actuation when the motor is de-clutched.

A second electric motor 17 is provided to actuate screws 9*d* and 9*g*; it is energized through a plug 17^0 to which it is connected by means of wires passed through an articulated tubing 18. Plug 17^0 is itself connected with pedals 17^1 and 17^2 on base 16. And there is also provided a pair of end switches 17^{10} and 17^{20} to cause motor stoppage at the ends of the stroke.

In Fig. 7 it will be seen that motor 17 drives a

shaft 17*d* extending horizontally along one side of the structure, said shaft being chain connected with another shaft 17*g* extending along the other side, and shafts 17*d* and 17*g* driving screws 9*d* and 9*g* by means of chains and sprockets. Hand actuation is enabled by a square end 17^{00} in cooperation with a clutch not illustrated.

A third electric motor 19 is disposed within a casing 7^0 on member 7*t* of frame 7; it is controlled through a plug 19^0 by pedals 19^1 and 19^2 on base 16, associated with end switches 19^{10} and 19^{20}. The gearing between motor 19 and screws 14*t* and 14*p* comprises a pair of gears connecting said screws with an actuating shaft 14*d* carried along member 7*d*. Shaft 14*d* is connected with motor 19 by means of a slidable pinion 19^3 forming a clutch and there is provided a square 19^{00} to permit hand actuation.

The support 10 of the X-ray bulb is slidably fixed on the transverse sides 20*p* and 20*t* of a frame, the longitudinal sides 20*d* and 20*g* of which are slidable along members 7*d* and 7*g*. The side member 20*g* is provided with two superimposed longitudinal bores; the first one, which is threaded, is adapted to receive a screw 21 pivotally supported by frame 7; and the second one which is cylindrical, slidably receives a square shaft 22 also pivotally carried by frame 7. There is provided a chain sprocket 22*g* on shaft 22 and another chain sprocket 22*d* loose on a journal carried by the other longitudinal side 20*d*, and sprockets 22*g* and 22*d* are connected with each other by means of a chain fixed to a pin 10^0 carried by the corresponding transverse side of support 10.

It will be understood that the X-ray bulb may thus be moved longitudinally by actuating screw 21, and transversely by actuating shaft 22. This actuation may be performed by hand, through square ends 21^0 and 22^0, or electrically, by means of an electric motor associated with control means of the kind described with reference to Figs. 7 to 9.

The arching device comprises a pair of rectangular plates 23*t* and 23*p* articulated to each other along one of their transverse sides while their opposed transverse sides are provided with wings 24*td* and 24*tg* or 24*pd* and 24*pg* with transverse pins. This device also embodies two pairs of slides 25*td* and 25*pd* or 25*tg* and 25*pg*, which are mounted respectively on the right and left transverse members of frame 3 or, preferably as shown, on the transverse members 26*d* and 26*g* of an additional frame freely carried by the former and adapted to be used as a stretcher for carrying the patient, by means of sockets 26*td* and 26*pd* or 26*tg* and 26*pg* provided in the angles of the said additional frame to receive gudgeons 27 *td* and 27*pd* or 27*tg* and 27*pg* projecting upwardly from the carrier shafts 27*d* and 27*g* (Fig. 11). Slides 25*td*, 25*tg*, 25*pd* and 25*pg* are provided with inwardly projecting edges having on their upper face a series of notches adapted to receive the transverse pins of wings 24*td*, 24*tg*, 24*pd* and 24*pg* respectively.

Means are also provided to move the slides of each pair towards those of the other pair, such means comprising preferably a pair of screws 28*d* and 28*g* pivotally carried by the additional frame 26 in parallel relation with respect to the longitudinal members thereof, such screws being provided with opposed pitches in such a manner that by rotating same the two pairs of slides may be moved in opposed direction. Screws 28*d* and 28*g* are driven either by hand, through a square end 28^0, or electrically by means such as described with reference to Figs. 7 to 9.

The table described also comprises a head support 29*t* and a foot support 29*p*, each being carried by broaches driven through the tubular ends of the longitudinal members of frame 3 and fixed at the appropriate position by means such as radial pins.

Fig. 10 shows an adjustable abutment comprising a splitted collar 30 slidably keyed on transverse member 3*g* (or 3*d*) and clamped in position by means of a screw 30^1, a double plain collar 31 formed of two elements between which collar 30 is comprised, and a body 31^1 integral with collar 31, the said body receiving the lower end of a tubular rod 32 forming a telescopic arrangement with another 33. The upper end of rod 32 is splitted and it is provided with a clamping screw 32^1. Rod 33 carries a splitted collar in which there may be clamped a rod 34 to which there is articulated the curved plate 35 forming the abutment proper. A screw 33^1 permits of clamping rod 34 at the desired position.

Collar 31 is angularlly fixed on member 3*g* by means of ratchet teeth cut in collar 30 and engaged by a pawl, not illustrated, pressed by a spring and freed by a hand lever 31^2. It will readily be grasped that by lifting lever 31^2 the pawl is disengaged from the ratchet and collar 30 is free to rotate.

There is associated with the table described an X-ray support comprising a carriage 36 supported by castor wheels and provided with broaches 37*d* and 37*g* by means of which it may be fixed to the base 1 of the table through sockets 38*d* and 38*g* provided on the same. This carriage supports two uprights 39*d* and 39*g* connected by a cross-bar 39. Uprights 39*d* and 39*g* slidably support sleeves 40*d* and 40*g*, each carrying another sleeve 41*d* and 41*g* respectively, with their axes horizontal. Arms 43*d* and 42*g* are driven through sleeves 41*d* and 41*g*; they are preferably square in cross-section, as well as the corresponding sleeves themselves, and they are provided with a circular axial hole. Each arm supports a rod 42*d* and 43*g* engaged into the axial bore thereof and having at its rear end a clamping device comprising a handle 44*d* or 44*g* adapted to be screwed on the said end. Arms 42*g* and 42*d* support a frame 46 adapted to receive a screen or a photographic plate and an X-ray bulb 47.

Pulleys 43*d* and 43*g* are arranged at the upper end of uprights 51*d* and 51*g* on the same transverse shaft 48. The lower end of said uprights also comprises pulleys 49*g* and 49*d* on the same transverse shaft 49 and the said pulleys receive two endless wires or strings 42*g*′ and 49*d*′ attached to noses 50*d* and 50*g* carried by sleeves 40*d* and 40*g*. Counterweights 51*d* and 51*g* are provided to balance the weight of the parts associated with the sleeves.

The carriage also supports the electrical apparatus 52 supplying current to the X-ray bulb, and it is provided with a column 53 with an articulated handle 54 by means of which the carriage may be moved.

It will easily be grasped that the carriage thus established permits of placing the X-ray bulb and the corresponding frame at any position. Fig. 13 shows by way of example in dash and dot lines the position corresponding to an X-ray exposure with the bulb under the body.

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BY A. P. C.

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SURGICAL TABLES
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457,509
8 Sheets-Sheet 1

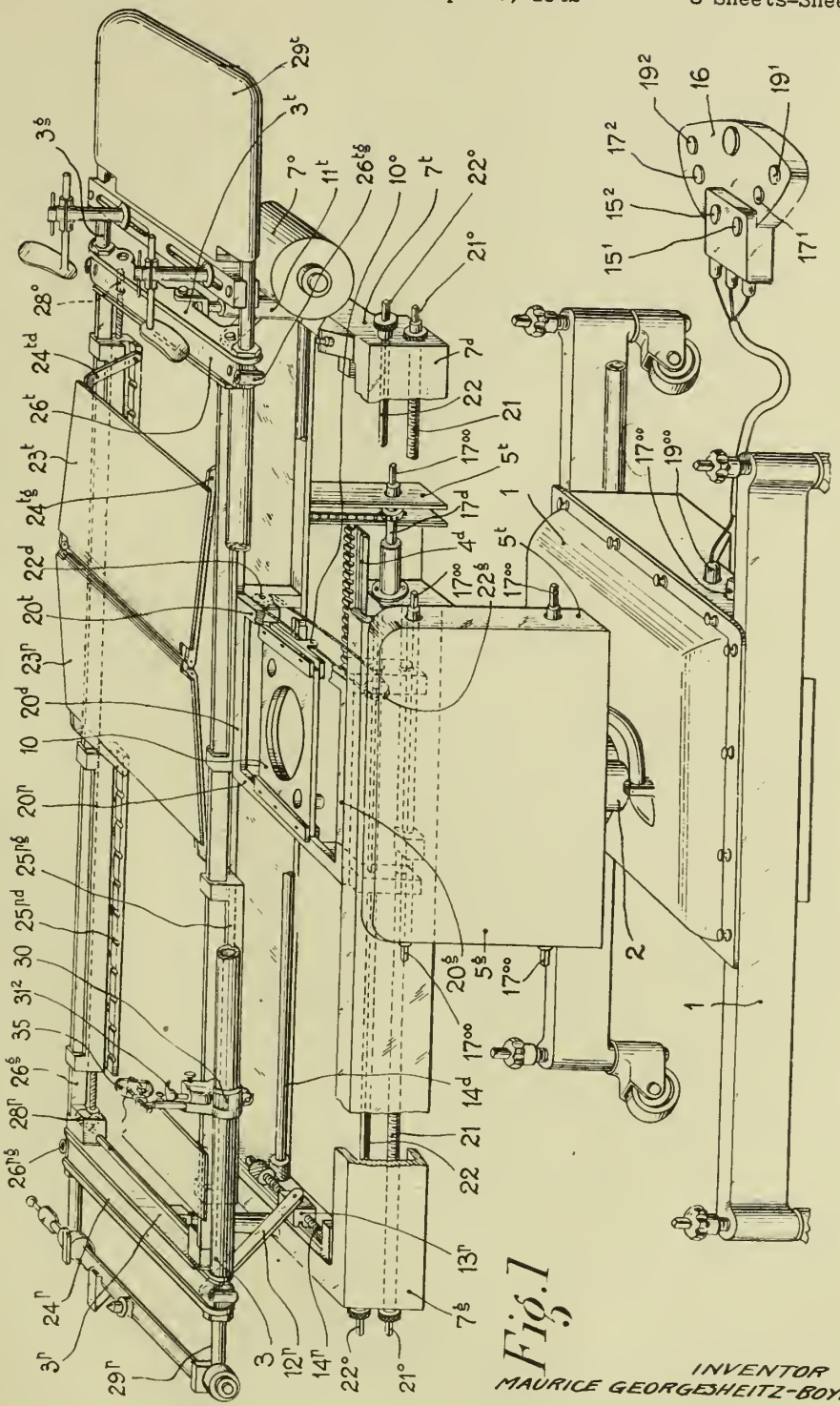

Fig. 1

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Fig. 3.

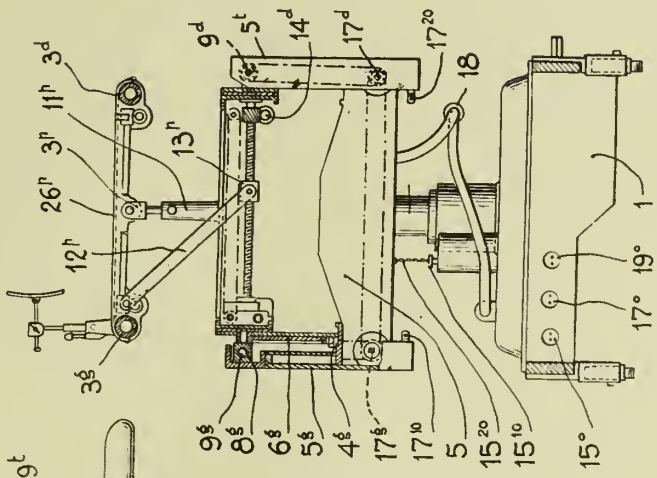

Fig. 2

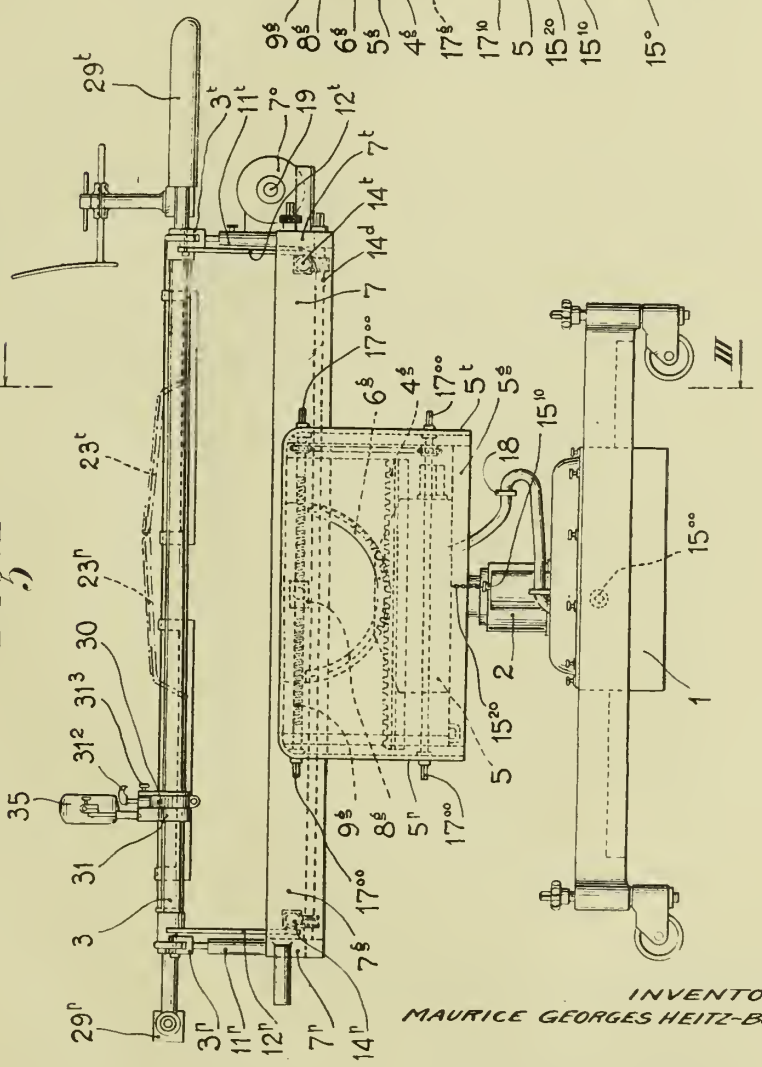

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Fig. 3.

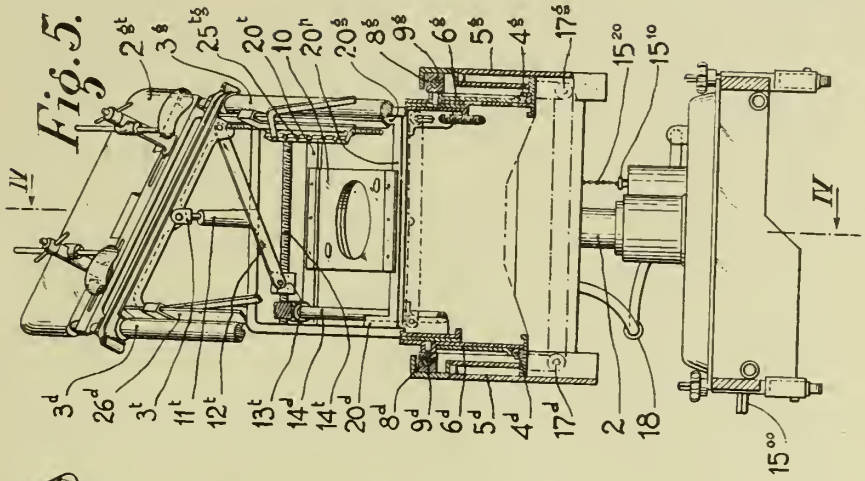

Fig. 4

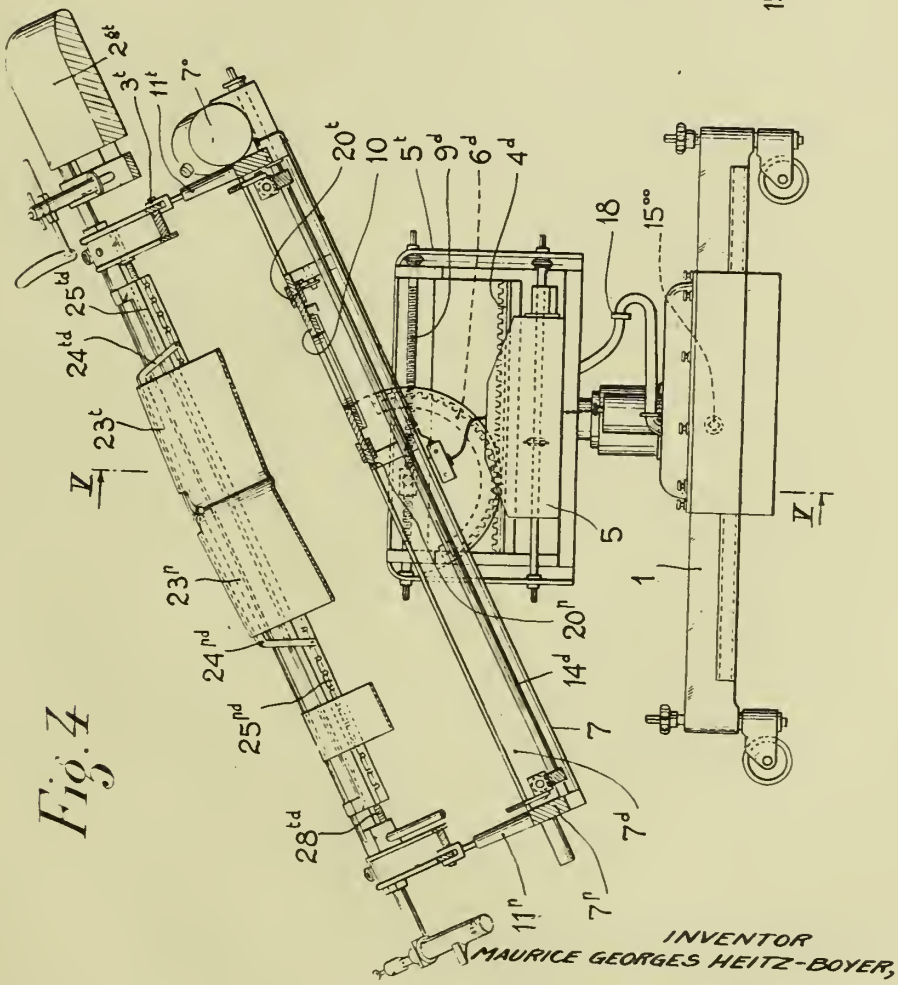

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Fig. 6.

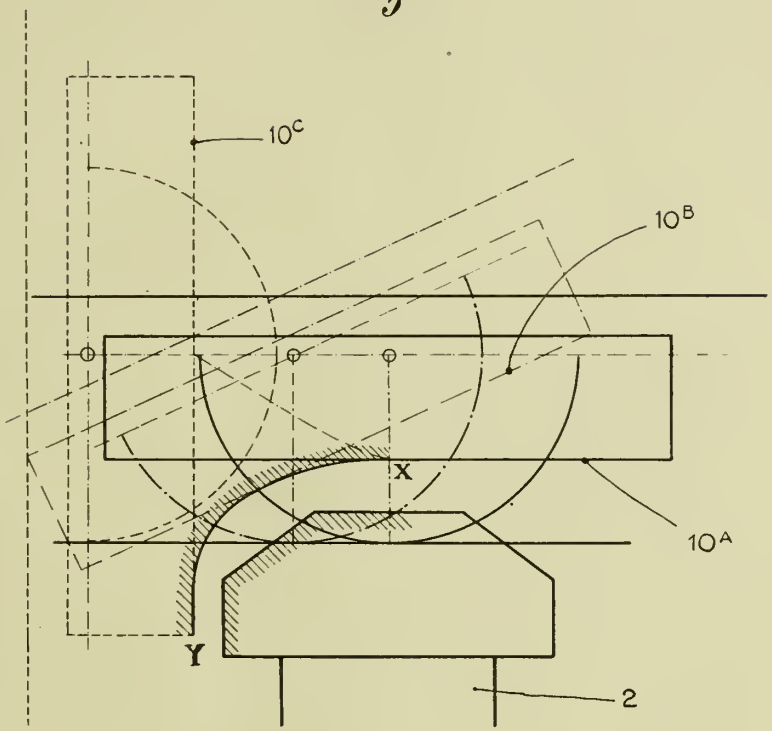

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Fig. 10.

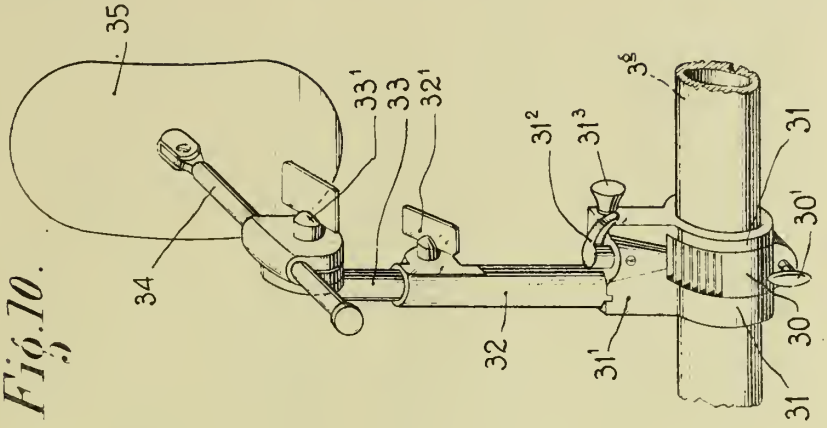


Fig. 9.

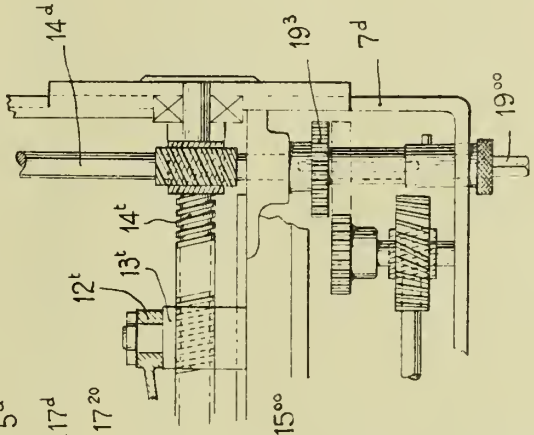


Fig. 7.

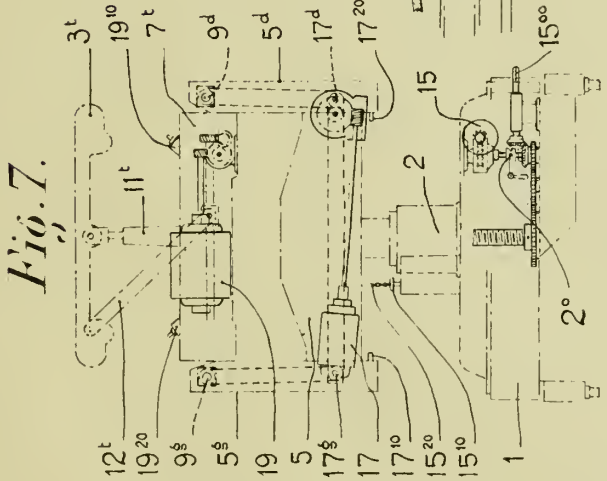
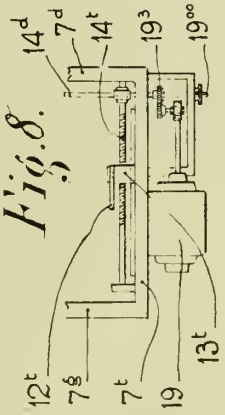


Fig. 8.



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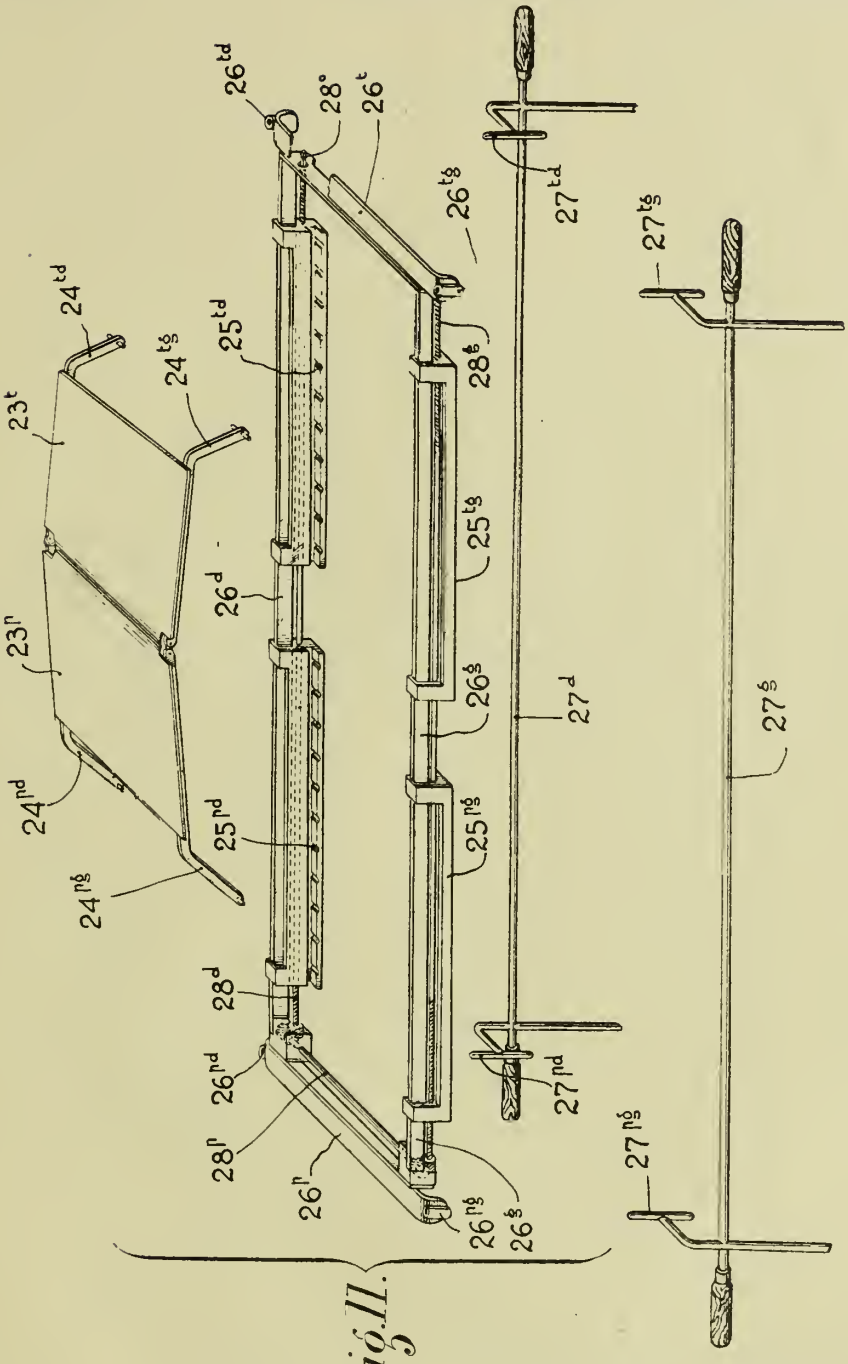

Fig. II.

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8 Sheets-Sheet 7

Fig: 12

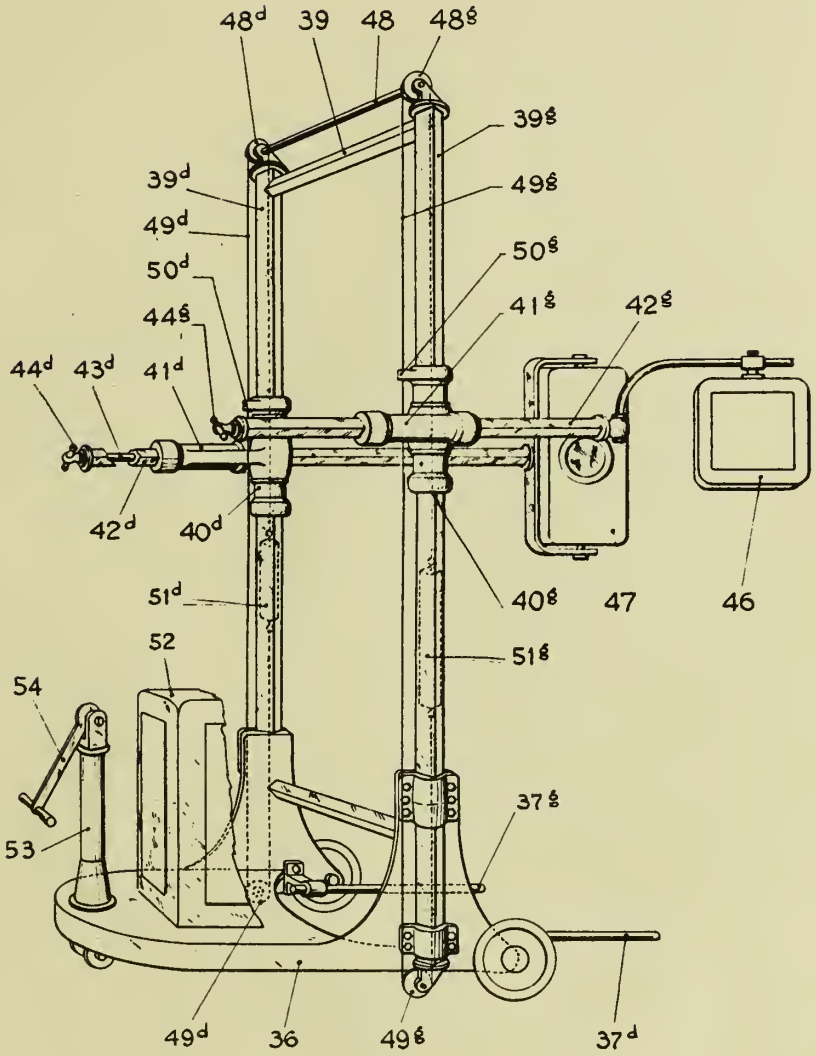

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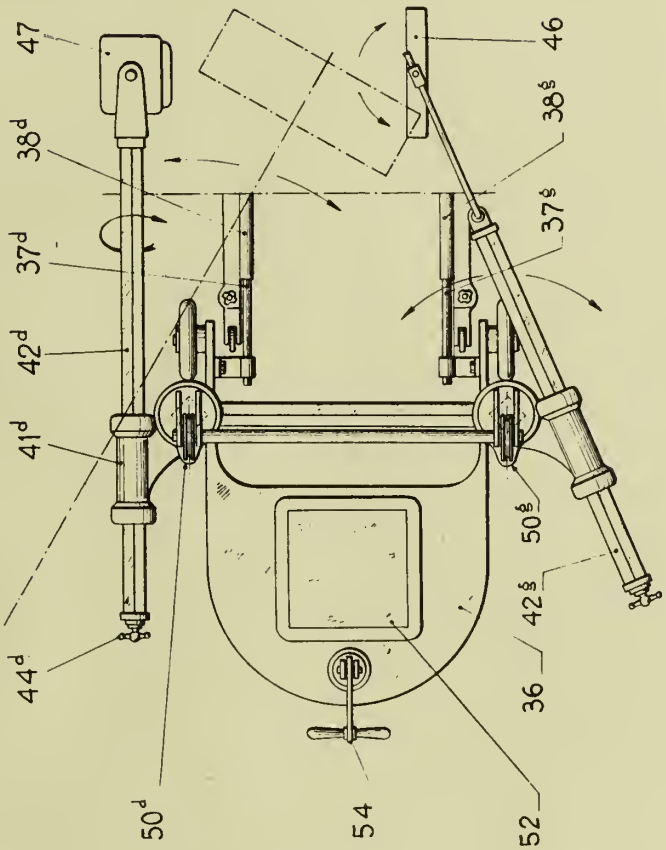
Fig. 13



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